

# MENTAL MODELS FOR TRADING

KALID AZAD, [BETTEREXPLAINED.COM](https://betterexplained.com)

**-1**

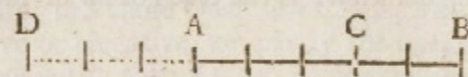
**“Negative numbers **darken the very whole doctrines of the equations...**”**

– FRANCIS MASÈRES, 1759

**WHY WAS THAT HARD?**

Yet is not that Supposition (of Negative Quantities,) either Unuseful or Absurd; when rightly understood. And though, as to the bare Algebraick Notation, it import a Quantity less than nothing: Yet, when it comes to a Physical Application, it denotes as Real a Quantity as if the Sign were +; but to be interpreted in a contrary sense.

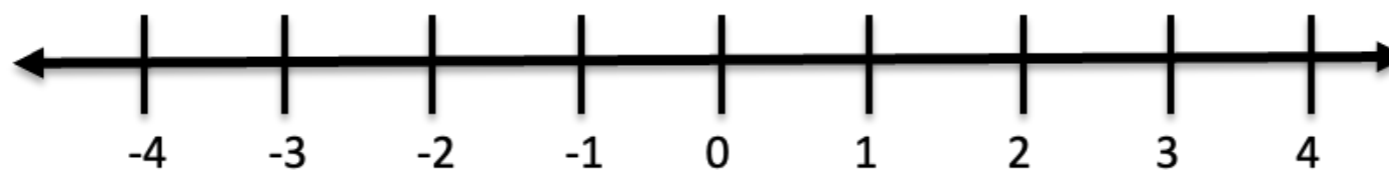
As for instance: Supposing a man to have advanced or moved forward, (from A to B,) 5 Yards; and then to retreat (from B to C) 2 Yards: If it be asked, how much he had Advanced (upon the whole march) when at C? or how many Yards he is now Forwarder than when he was at A? I find (by Subtracting 2 from 5,) that he is Advanced 3 Yards. (Because  $+5 - 2 = +3$ .)



But if, having Advanced 5 Yards to B, he thence Retreat 8 Yards to D; and it be then asked, How much he is Advanced when at D, or how much Forwarder than when he was at A: I say  $-3$  Yards. (Because  $+5 - 8 = -3$ .) That is to say, he is advanced 3 Yards less than nothing.

Which in propriety of Speech, cannot be, (since there cannot be less than nothing.) And therefore as to the Line AB *Forward*, the case is Impossible.

WALLIS, TREATISE OF ALGEBRA (1685)



MODERN DAY



# Baseline vs. Progressive



WHAT WILL WE REMEMBER?

# ADEPT Method

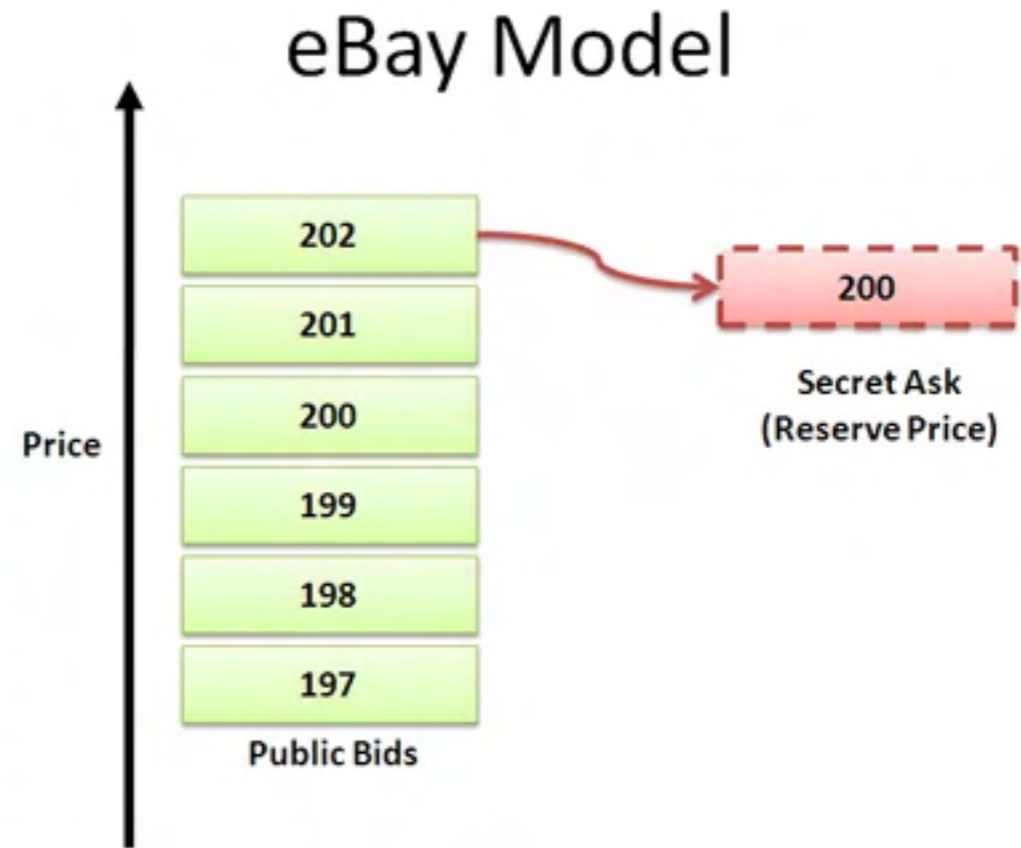
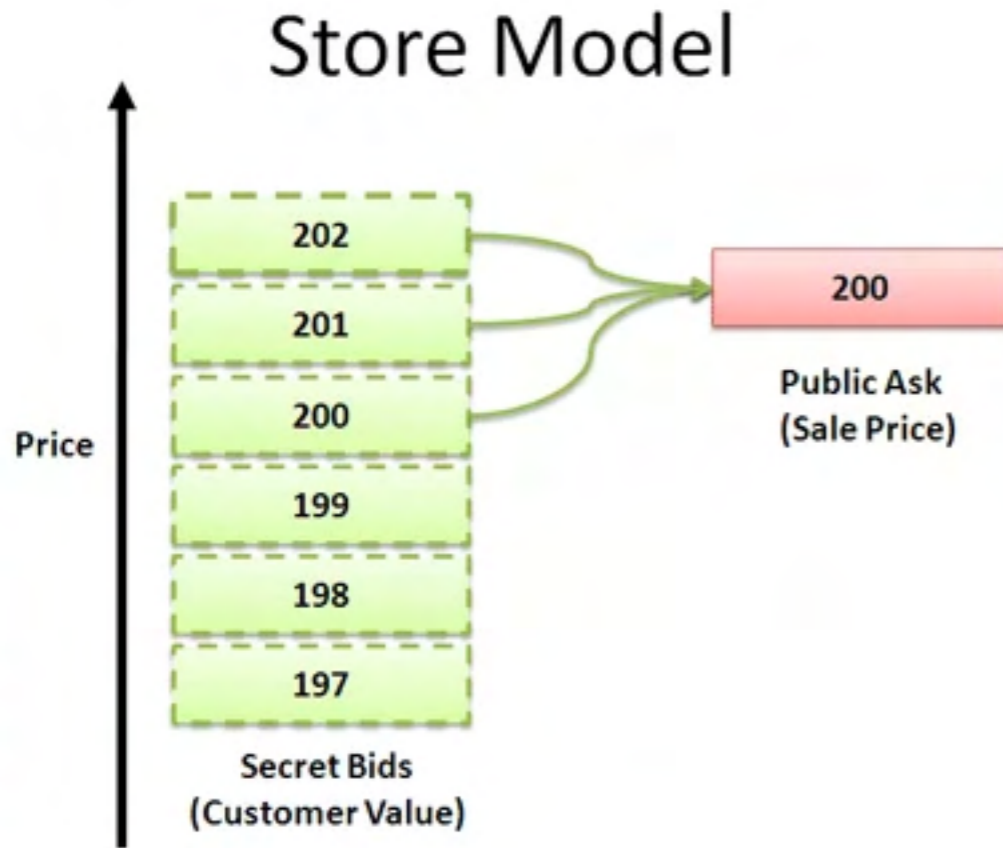
ANALOGY	Tell me what it's like
DIAGRAM	Help me visualize it
EXAMPLE	Allow me to experience it
PLAIN ENGLISH	Describe it with everyday words
TECHNICAL	Discuss the formal details

# MARKETPLACES

- Amazon
- Ebay
- Zillow



# PRICING MODELS



# FEATURE REQUESTS

CAMELCAMELCAMEL

EBAY



ebay Shop by category

Related: [airpods pro case](#) [apple airpods pro](#) [airpods 2nd generation](#) [airpods 3rd gener](#)

Category: All, Cell Phones & Accessories, Cell Phone Accessories, Cases, Covers & Skins, Chargers & Cradles, Headsets, Other Cell Phone Accessories, More, Consumer Electronics, Sports Mem, Cards & Fan Shop, Jewelry & Watches, Entertainment Memorabilia

All Listings Accepts Offers Auction Buy It Now Condition Shipping

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\$165.99  
Buy It Now  
Free 4 day shipping  
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Create Amazon Price Watches

We'll send an email to

When the  Drops to

PRICE HISTORY  
ALERTS / AUTOBUY

STANDING, UNIFIED BID

# PUBLIC MARKET

## Market Model



MM Name	Bid Price	Size	MM Name	Ask Price	Size
BATS	204.91	19	BATS	204.92	15
BYX	204.91	1	BYX	204.92	2
DRCTEDGE	204.91	12	DRCTEDGE	204.92	6
EDGEA	204.91	2	EDGEA	204.92	2
NSDQ	204.91	1	NSDQ	204.92	1
NSDQ	204.90	10	NSDQ	204.93	11
NSDQ	204.89	29	NSDQ	204.94	46
NSDQ	204.88	69	NSDQ	204.95	12
NSDQ	204.87	32	NSDQ	204.96	95
NSDQ	204.86	68	NSDQ	204.97	33

CENTRAL LOCATION

TRANSPARENT INVENTORY

PRICE HISTORY

"NAME YOUR PRICE" LIMIT ORDERS

"BUY IT NOW" MARKET ORDER

# GUTCHECKS

- Why does the price change?
- How many prices are there?
- Quantity of buyers/sellers vs. aggression?

# Stock Market: Better Store

analogy

Central location for  
buyers and sellers to  
trade, with public  
prices, orders, and  
history

plain English

## (ORDER BOOK & HISTORY)

Bid			Ask		
MM Name	Price	Size	MM Name	Price	Size
BATS	204.91	19	BATS	204.92	15
BYX	204.91	1	BYX	204.92	2
DRCTEDGE	204.91	12	DRCTEDGE	204.92	6
EDGEA	204.91	2	EDGEA	204.92	2
NSDQ	204.91	1	NSDQ	204.92	1
NSDQ	204.90	10	NSDQ	204.93	11
NSDQ	204.89	29	NSDQ	204.94	46
NSDQ	204.88	69	NSDQ	204.95	12
NSDQ	204.87	32	NSDQ	204.96	95
NSDQ	204.86	68	NSDQ	204.97	33



diagram / example

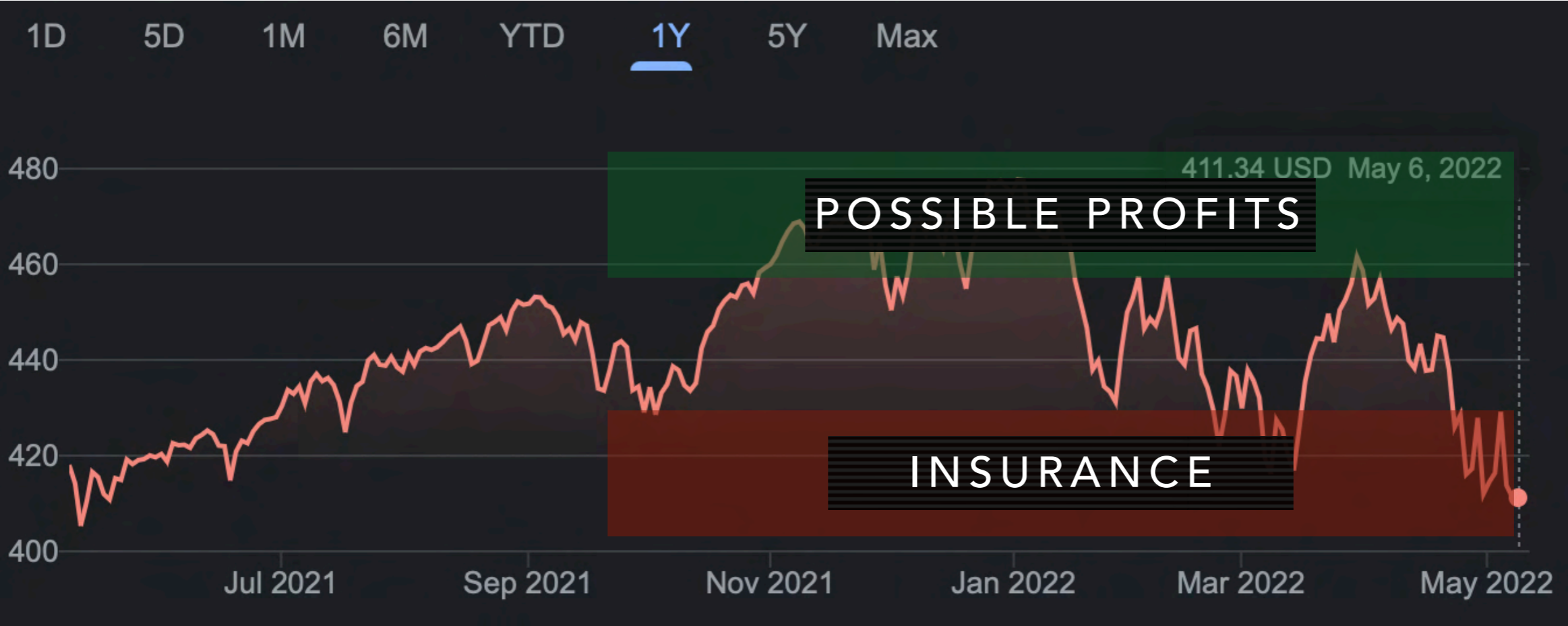
Spreads  
Dealers  
Market Makers  
Exchanges  
Order Routing

technical

# OPTIONS

- Right to buy or sell at a given price, for some time
- Everyday examples
  - Pre-orders
  - Coupons
  - Insurance
  - Paid warranty

# OPTIONS



# OPTIONS MARKET AT MANY PRICES/DATES



Expiration: 2022-05-06 (w) | 5 Strikes +/- | Side-by-Side | [Volume Graph](#) | [screen](#) | [download](#)

0 Days to expiration on 2022-05-06 | Implied Volatility: 15.44% | Historic Volatility: 25.41%

Calls										Puts								
Links	Last	Bid	Ask	Change	Volume	Open Int	IV	Last Trade	Strike	Last	Bid	Ask	Change	Volume	Open Int	IV	Last Trade	Links
⌵	3.50	2.88	3.20	-4.50	11,098	1,580	0.00%	05/06/22	407.00	0.40	0.39	0.40	-0.67	62,831	6,896	21.10%	05/06/22	⌵
⌵	2.38	1.86	2.58	-4.92	23,693	1,710	0.00%	05/06/22	408.00	0.66	0.66	0.69	-0.65	82,356	11,447	22.03%	05/06/22	⌵
⌵	1.40	0.94	1.69	-5.11	27,668	2,580	0.00%	05/06/22	409.00	1.12	1.04	1.08	-0.43	73,126	11,116	23.67%	05/06/22	⌵
⌵	0.33	0.30	0.33	-6.16	112,018	4,675	0.00%	05/06/22	410.00	1.69	1.56	1.59	-0.17	112,870	30,535	25.53%	05/06/22	⌵
⌵	0.03	0.02	0.03	-5.67	65,042	4,412	0.00%	05/06/22	411.00	1.94	2.18	2.34	-0.24	47,436	7,635	28.38%	05/06/22	⌵
⌵	0.01	0.01	0.02	-5.22	120,218	6,275	1.98%	05/06/22	412.00	2.70	2.91	3.15	0.14	34,767	10,985	31.39%	05/06/22	⌵
⌵	0.01	0.01	0.01	-4.56	75,485	7,354	4.13%	05/06/22	413.00	4.16	3.58	4.10	1.18	15,304	9,150	34.25%	05/06/22	⌵
⌵	0.01	0.01	0.01	-4.03	85,784	9,008	6.11%	05/06/22	414.00	4.63	4.65	5.05	1.20	8,379	13,345	39.09%	05/06/22	⌵
⌵	0.01	0.01	0.01	-3.50	210,144	14,124	8.00%	05/06/22	415.00	5.90	5.44	6.03	1.99	6,826	39,581	44.16%	05/06/22	⌵
⌵	0.01	0.01	0.01	-3.05	100,413	15,528	9.83%	05/06/22	416.00	6.95	6.59	7.01	2.59	2,020	9,334	49.04%	05/06/22	⌵

# OPTION MARKET AT DATE



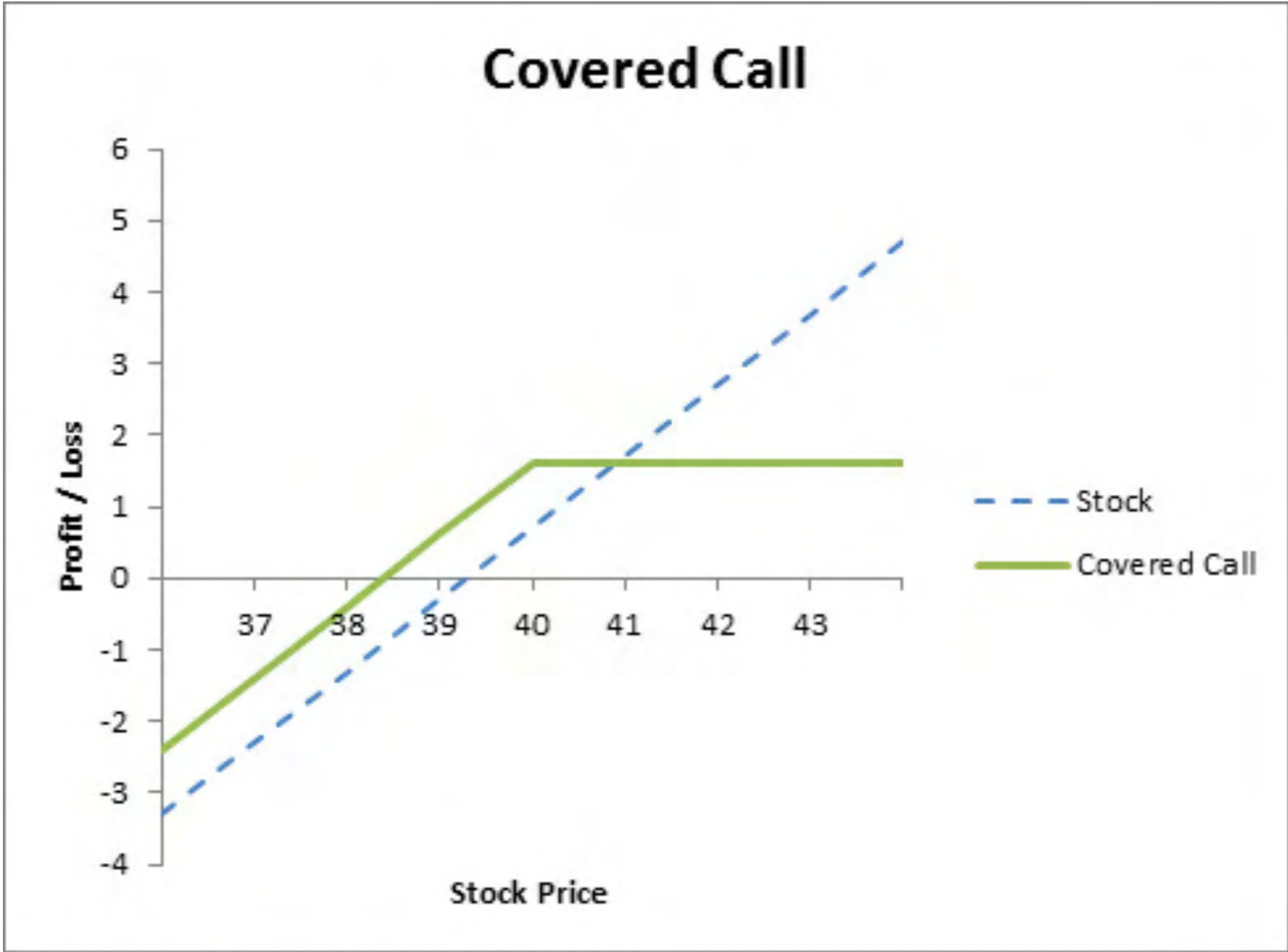
SPY	May 6	Jun 7	Jul 9	Aug 10	Sep 11	Oct 13	Nov 14	Dec 16	Jan 17	Feb 18	Mar 22	Apr 23	May 25	Jun 26	Jul 28	Aug 29	Sep 30	Nov 1	Dec 3	Jan 4	Feb 5	Mar 8	Apr 9	May 11	Jun 12	Jul 14	Aug 15	Sep 16	Oct 18	Nov 19	Dec Exp	+/-%
500.00	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	8949	21.80%
495.00	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	8449	20.58%
490.00	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	7949	19.36%
485.00	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	7449	18.15%
480.00	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	6949	16.93%
475.00	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	6449	15.71%
470.00	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	5949	14.49%
465.00	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	5449	13.27%
460.00	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	4949	12.06%
455.00	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	4449	10.84%
450.00	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	3949	9.62%
445.00	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	3449	8.40%
440.00	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	2949	7.18%
435.00	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	2449	5.97%
430.00	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	1949	4.75%
425.00	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	1449	3.53%
420.00	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	949	2.31%
415.00	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	1.09%
410.00	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-51	-0.12%
405.00	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-551	-1.34%
400.00	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-1051	-2.56%
395.00	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-1551	-3.78%
390.00	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-2051	-5%
385.00	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-2551	-6.21%
380.00	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-3051	-7.43%
375.00	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-3551	-8.65%
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365.00	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-4551	-11.09%
360.00	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-5051	-12.30%

# LONG STOCK

OWN ALL PROFITS / LOSSES  
FOR ALL TIME



# OPTIONS PAYOFF DIAGRAM



# WHAT SHOULD OPTIONS COST?

- Historically: contracts traded individually, over the counter
- How much should you pay? Which factors matter?
- Car insurance policy based on:

VARIABLE	Sensitivity of value
CAR AGE	?
CAR VALUE	?
YOUR AGE	?
YOUR RISK FACTORS	?
POLICY COVERAGE	?



# BLACK-SCHOLES MODEL

WHAT DETERMINES OPTIONS PRICE?	
VARIABLE	Sensitivity of option value ("Greeks")
STRIKE PRICE	Fixed during contract
STOCK PRICE	Delta, Gamma
VOLATILITY	Vega
INTEREST RATE	Rho
TIME LEFT	Theta

$$C(S, t) = N(d_1)S - N(d_2)Ke^{-rT}$$

$$d_1 = \frac{\ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

$C(S, t)$  (call option price)

$N(\ )$  (cumulative distribution function)

$T = (T_1 - t)$  (time left til maturity (in years))

$S$  (stock price)

$K$  (strike price)

$r$  (risk free rate)

$\sigma$  (volatility)

# HISTORY

- 1973: Black-Scholes Model published
- 1973: CBOE (first options exchange)
  - 1st day: 911 contracts traded
  - 1st month: More volume than all OTC
  - Today: >44M contracts daily
- 1997: Nobel Prize in Economics

# Options: Coupon, Profit Share, Insurance

analogy



May	Jun
897.00	897.00
898.00	898.00
899.00	899.00
900.00	900.00
901.00	901.00
902.00	902.00
903.00	903.00
904.00	904.00
905.00	905.00
906.00	906.00
907.00	907.00
908.00	908.00
909.00	909.00
910.00	910.00
911.00	911.00
912.00	912.00
913.00	913.00
914.00	914.00
915.00	915.00
916.00	916.00
917.00	917.00
918.00	918.00
919.00	919.00
920.00	920.00
921.00	921.00
922.00	922.00
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939.00	939.00
940.00	940.00
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992.00	992.00
993.00	993.00
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998.00	998.00
999.00	999.00
1000.00	1000.00

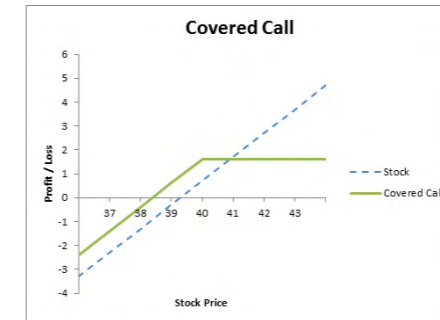


diagram / example

Opportunity to buy  
or sell at a specific  
price, by/on a given  
date

plain English

Black-Scholes Model  
Greeks  
Intrinsic/Extrinsic Value  
Implied Volatility

technical



# OPTIONS TRADING: BIG IDEAS

UNBUNDLE ASSET

COMMITMENT = PAID CONTRACT

AIRLINE TICKET =  
SEAT + FOOD + LUGGAGE  
+ VIEW + ...

GET PAID TO LIST ON EBAY  
GET PAID TO PREORDER

STOCK = 100% OF  
PROFITS/LOSSES FOREVER

SAMPLE COMMITMENTS

OPTIONS = PORTION OF  
PROFITS/LOSSES FOR  
SOME TIME

WILL BUY AT DISCOUNT  
WILL SELL AT PROFIT  
WILL HOLD FOR LONG TERM

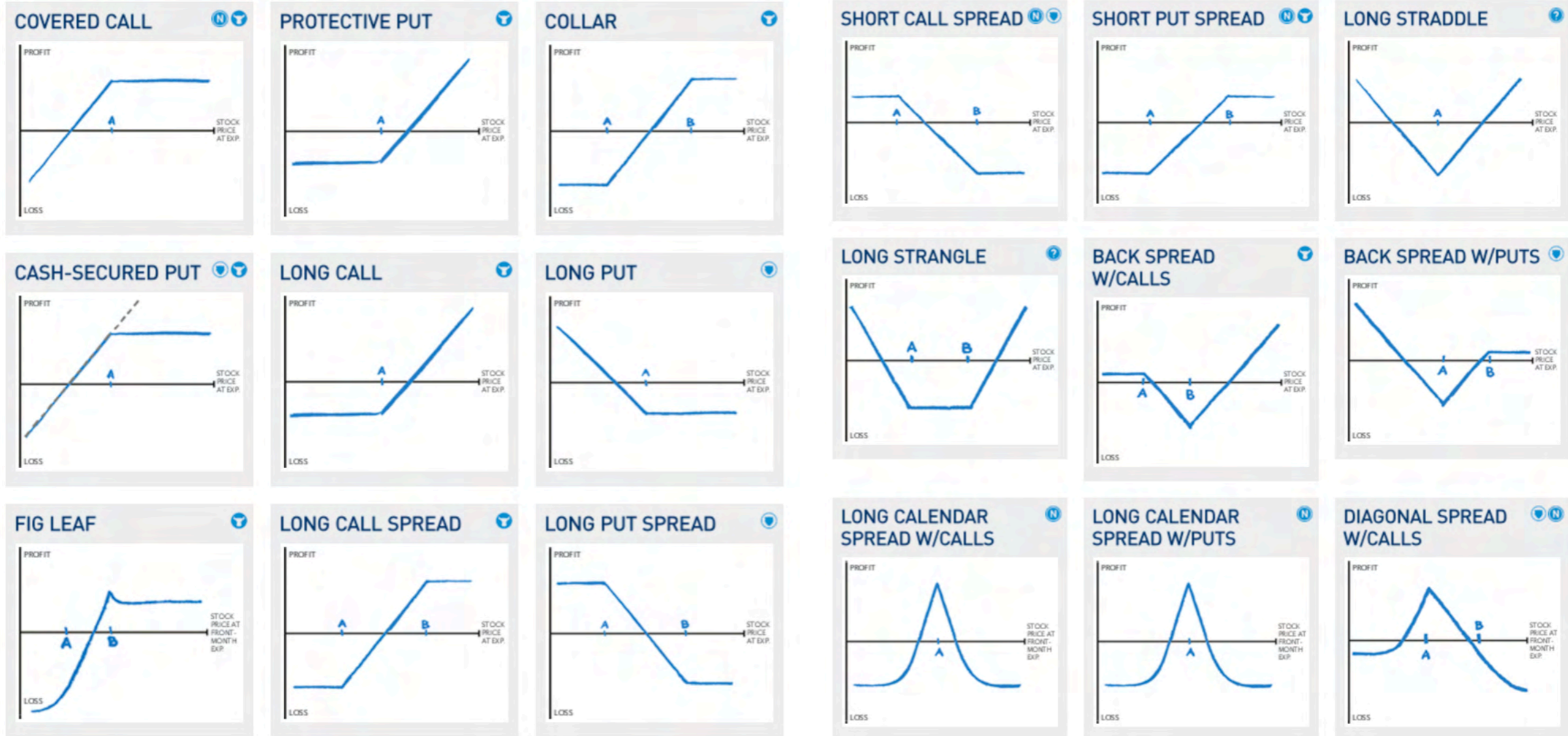
# Trading Strategies

INVESTMENT GOAL	Option Strategy
BUY POSSIBLE PROFITS	Buy call
BUY INSURANCE	Buy put
SELL POSSIBLE PROFITS	Hold stock, sell call (covered call)
DISCOUNTED PREORDER	Have cash, sell put (cash-secured put)
BUY PROFIT RANGE	Buy call spread
SELL PROFIT RANGE	Sell call spread
SELL INSURANCE RANGE	Sell put spread
STOCK SUBSTITUTE	Buy long-term, high-delta call (LEAP)

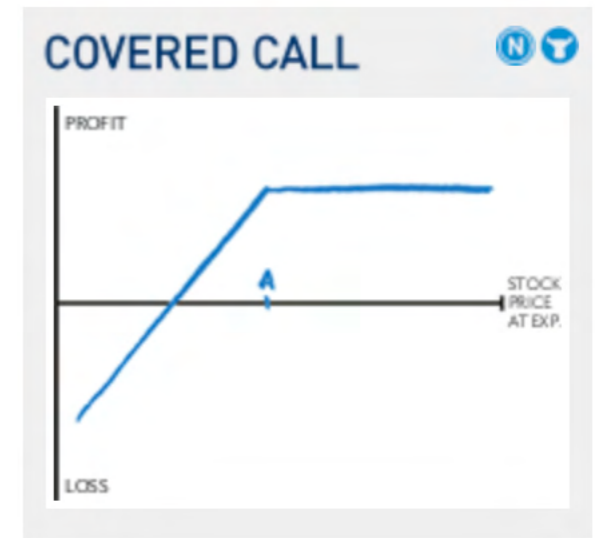
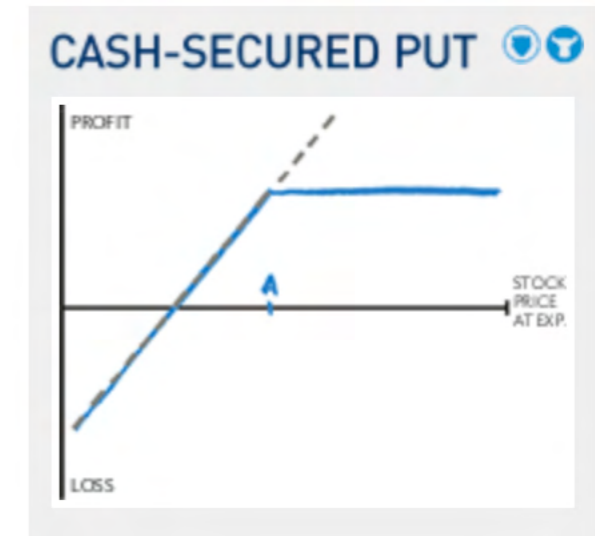
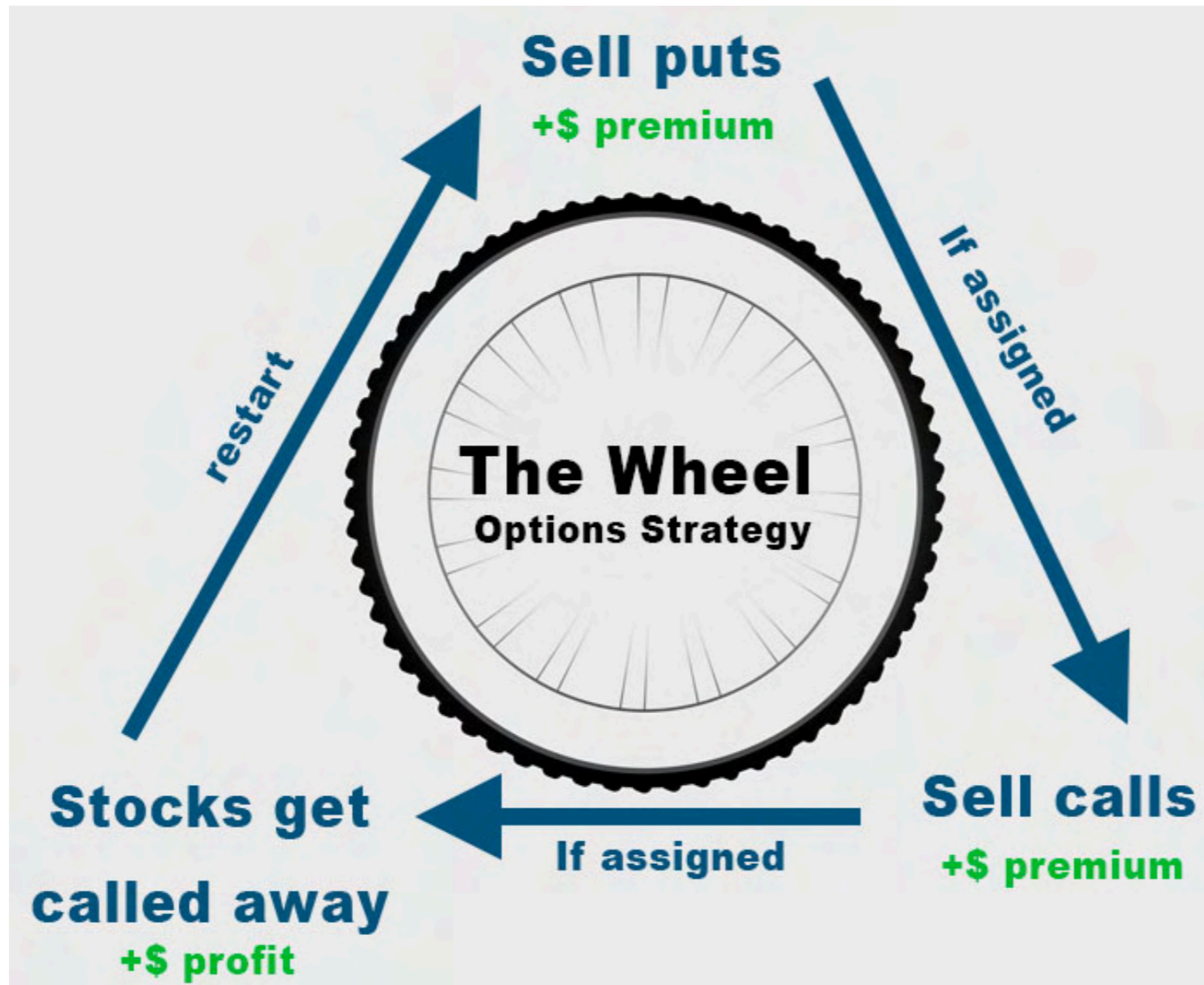
# Trading Strategies

## OPTION STRATEGIES

Filter by market outlook ▾



# EXAMPLE STRATEGY



SELL PROFITS, DISCOUNTED PREORDER

# Summary

**Learning**  
Analogies First

**Stock Market**  
Better Store

**Options**  
Coupons, Insurance

**Trading**  
Sell your peanuts

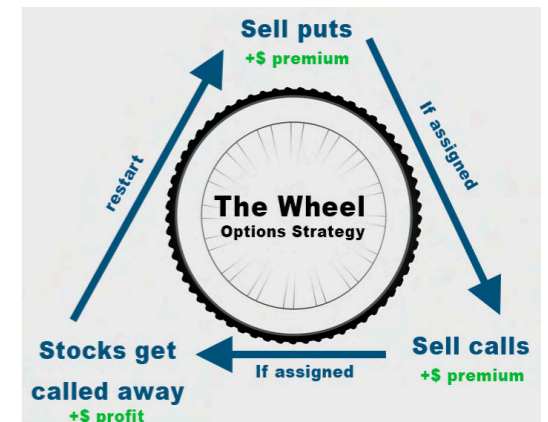
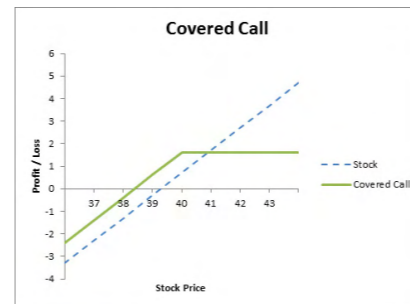
## Baseline vs. Progressive



## Market Model



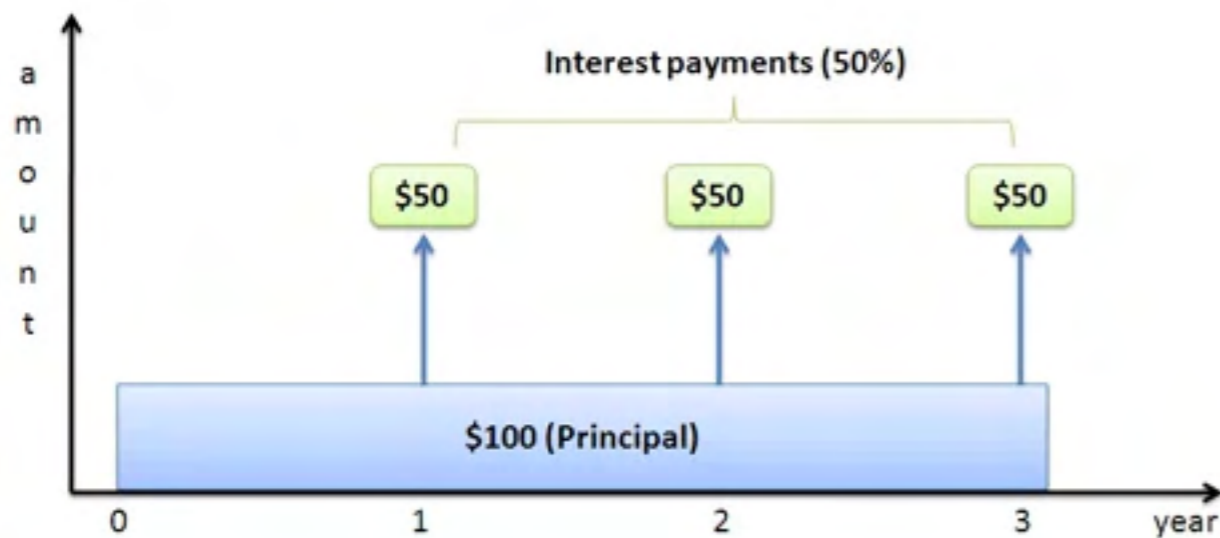
	May	Jun	Exp	
SPY	9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6	+1.26	
500.00	244 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500	501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600	601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700	701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800





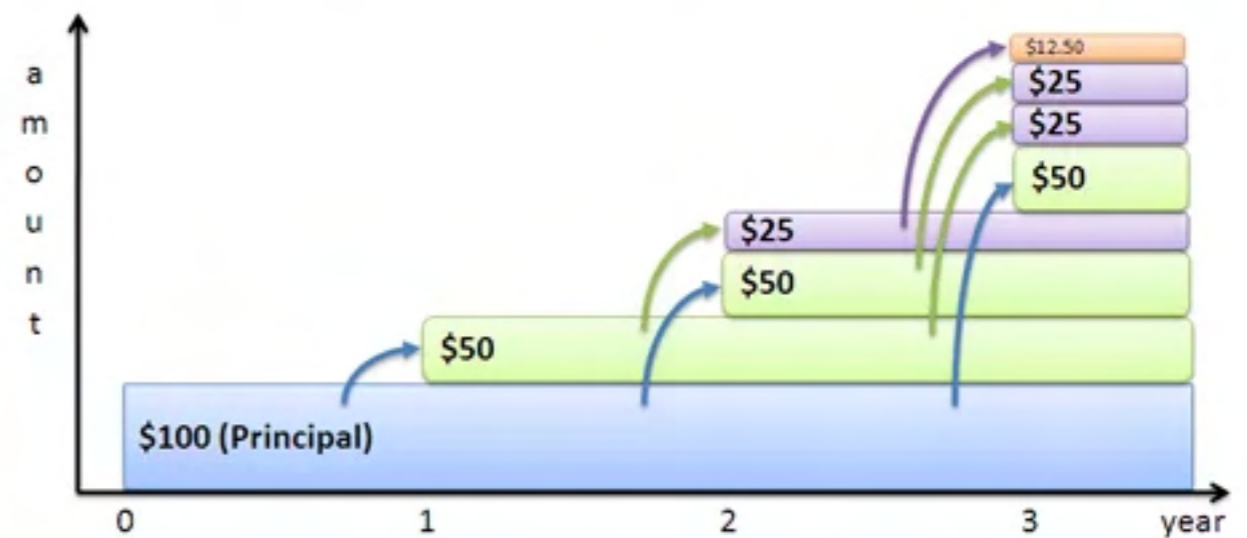
# BONUS: RULE OF 72

## Simple Interest



GREEN = DIRECT

## Compound Interest (Factory)

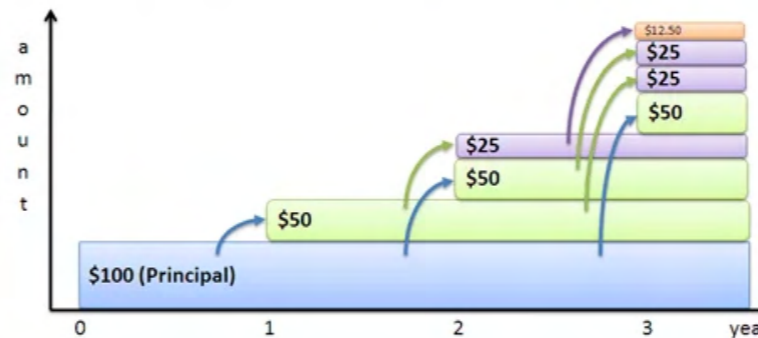


PURPLE, ORANGE... = COMPOUND EFFECT

# Rule Of 72: Road Trip To Doubleville

analogy

### Compound Interest (Factory)



Pct/yr → Doubling Time

- 1% → 72 years
- 2% → 36 years
- 3% → 24 years
- 10% → 7.2 years

diagram / example

The time to double is roughly 72 divided by interest rate.

plain English

$$1 * e^{RT} = 2$$
$$RT = \ln(2) = .693 \sim .72$$
$$T = .72 / R$$

[change "R=.05" to "R=5"]

$$T = 72 / R$$

technical