Investment Modeling: A Software Engineer's Approach

Cem Kaner, J.D., Ph.D.

Executive Vice-President, Association for Software Testing

Professor of Software Engineering, Florida Institute of Technology

October, 2009

These notes are partially based on research that was supported by NSF Grant CCLI-0717613 "Adaptation & Implementation of an Activity-Based Online or Hybrid Course in Software Testing." Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Background

- One of the toughest challenges in teaching testing is getting beyond a superficial treatment of the software under test.
- The problem is that the deeper testing requires deeper product knowledge. It can take a *long* teaching time to build deep enough insight into a product for the student tester to understand tests at that level.
- A year ago, I realized that remarkably many working professionals and even students had some familiarity with the stock market and with the challenges of making money (or even, protecting what you have) under current market conditions.
- This section is the result of almost a year's work gaining an understanding of this domain and of how it might be used as a teaching foundation for complex issues in testing and high-reliability programming

FIT students could also use an edge...

Unemployment For Young Americans Jumps To 52.2 Percent

First Posted: 09-27-09 12:47 PM | Updated: 09-27-09 03:32 PM

WHAT'S YOUR REACTION?

Google™ Custom Search | Search HuffPost

Amazing | Inspiring | Funny | Scary | Hot | Crazy | Important | Weird

Read More: Economy, Jobless Rate, Jobs, Unemployment Rates, Young Americans Unemployment Rate, Business News

Buzz up! Be the First to Submit This Story to Digg

***New York Post*:**

The unemployment rate for young Americans has exploded to 52.2 percent -- a post-World War II high, according to the Labor Dept. -- meaning millions of Americans are staring at the likelihood that their lifetime earning potential will be diminished and, combined with the predicted slow economic recovery, their transition into productive members of society could be put on hold for an extended period of time.

Read the whole story: *New York Post*

Reports like this have been catching my attention:

Goldman Sachs compensation: $1 mn per employee in sight

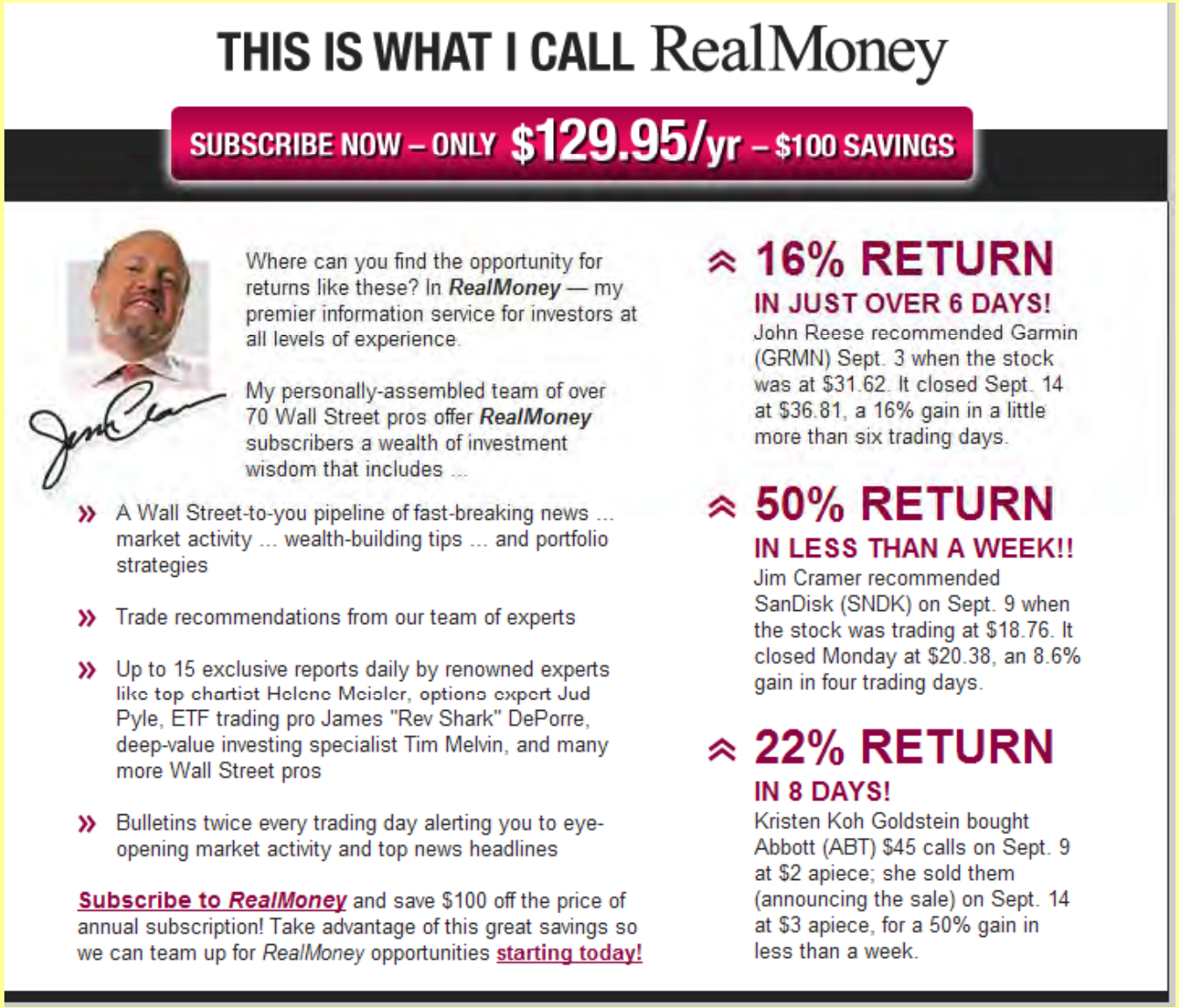
4 Jul 2009, 2105 hrs IST, REUTERS,
http://economictimes.indiatimes.com/articleshow/4777281.cms?prtpage=1

NEW YORK: The average Goldman Sachs Group Inc employee is within striking distance of $1 million in compensation and benefits this year, just nine months after the bank received a $10 billion US government bailout.
The figure will likely fuel criticism of the politically connected bank, especially amid the widening recession and rising unemployment. In addition to the bailout, Wall Street's biggest surviving securities firm also benefited from several other government schemes during the depths of last year's financial crisis.

Goldman on Tuesday said money set aside for pay surged 75 percent in the second quarter. Compensation and benefits costs were $6.65 billion, up 47 percent from the equivalent quarter in 2008.

Given a 16 percent reduction in staff from last year, to 29,400, the bank set aside an average $226,156 per employee in the second quarter, up from $129,200 in a year ago. If the quarterly figure is annualized, it comes to **$904,624 per employee**.

Or maybe you can just make yourself wealthy (?)



THIS IS WHAT I CALL RealMoney

SUBSCRIBE NOW – ONLY $129.95/yr – $100 SAVINGS

Where can you find the opportunity for returns like these? In *RealMoney* — my premier information service for investors at all levels of experience.

My personally-assembled team of over 70 Wall Street pros offer *RealMoney* subscribers a wealth of investment wisdom that includes ...

- A Wall Street-to-you pipeline of fast-breaking news ... market activity ... wealth-building tips ... and portfolio strategies
- Trade recommendations from our team of experts
- Up to 15 exclusive reports daily by renowned experts like top chartist Helene Meisler, options expert Jud Pyle, ETF trading pro James "Rev Shark" DePorre, deep-value investing specialist Tim Melvin, and many more Wall Street pros
- Bulletins twice every trading day alerting you to eye-opening market activity and top news headlines

Subscribe to *RealMoney* and save $100 off the price of annual subscription! Take advantage of this great savings so we can team up for *RealMoney* opportunities starting today!

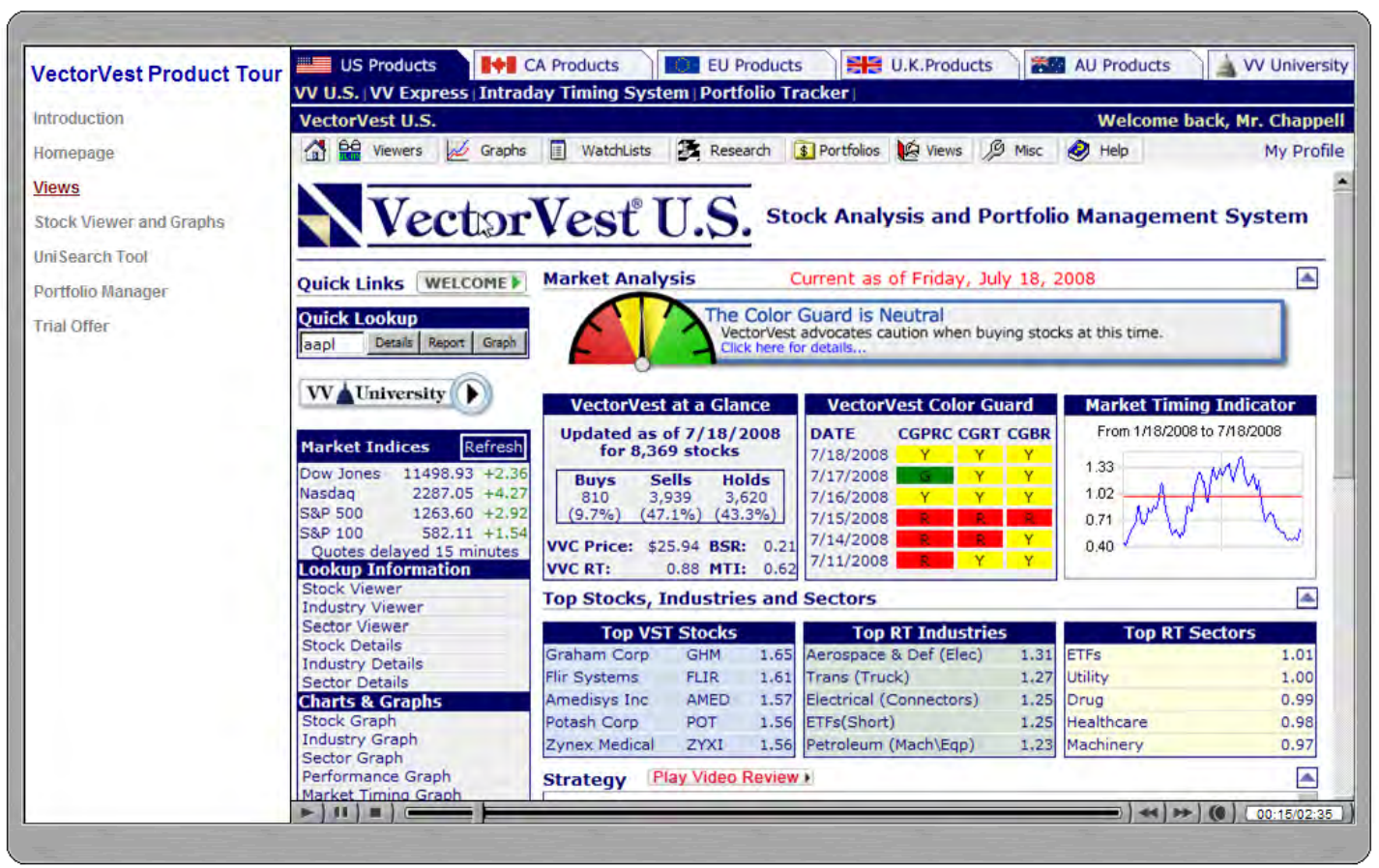
16% RETURN
IN JUST OVER 6 DAYS!
John Reese recommended Garmin (GRMN) Sept. 3 when the stock was at $31.62. It closed Sept. 14 at $36.81, a 16% gain in a little more than six trading days.

50% RETURN
IN LESS THAN A WEEK!!
Jim Cramer recommended SanDisk (SNDK) on Sept. 9 when the stock was trading at $18.76. It closed Monday at $20.38, an 8.6% gain in four trading days.

22% RETURN
IN 8 DAYS!
Kristen Koh Goldstein bought Abbott (ABT) $45 calls on Sept. 9 at $2 apiece; she sold them (announcing the sale) on Sept. 14 at $3 apiece, for a 50% gain in less than a week.

http://www.cnbc.com/id/18724672/
http://www.thestreet.com/tsc/emails/2009/rm_email_test_091909.html

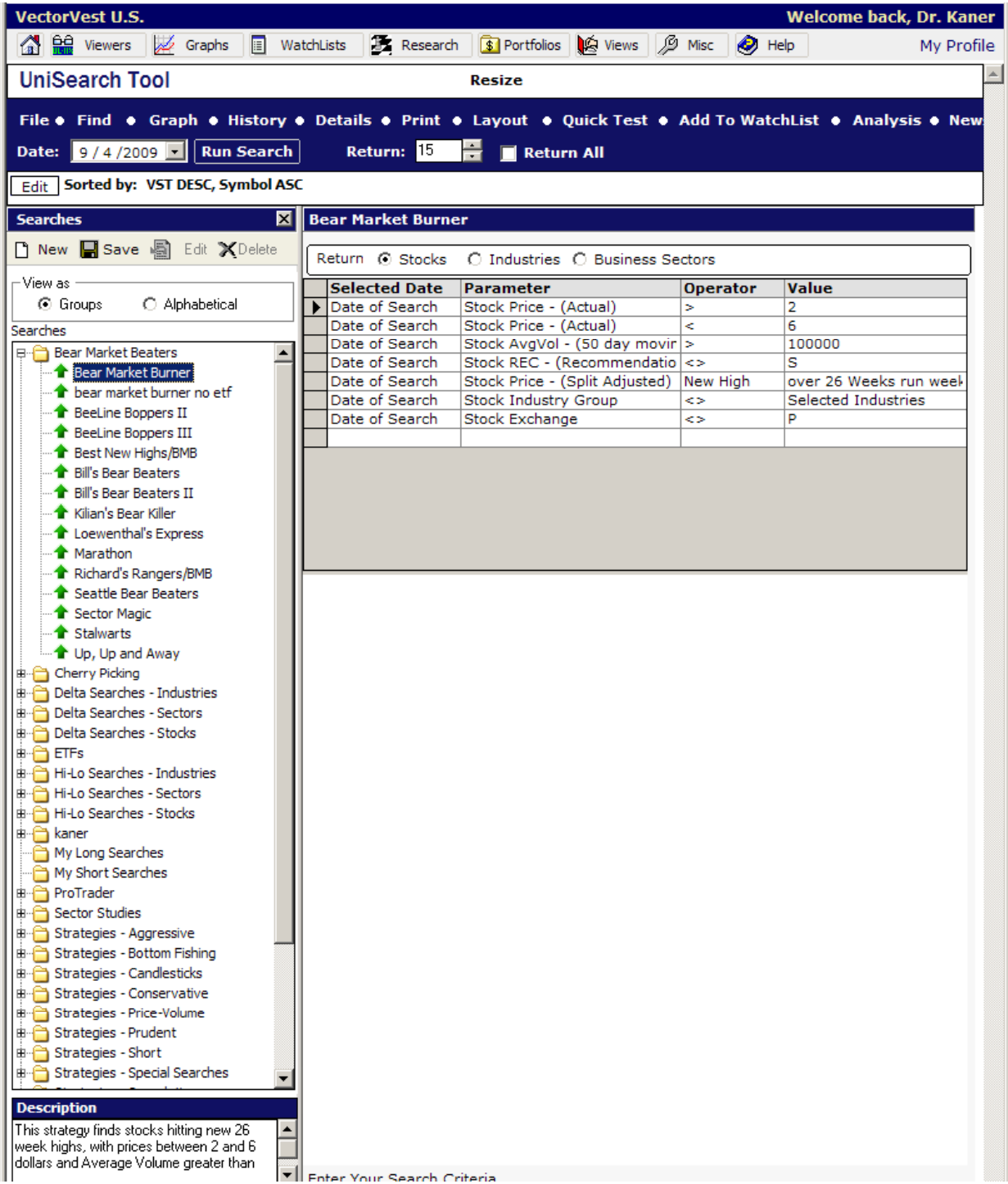
Can it be this easy?



(NOTE: I use VectorVest in several examples because I liked it enough to research it more carefully than its competitors.

Despite my critical comments, you should understand that this product offers significant benefits, especially in the accessibility of its highly detailed historical fundamentals data.)

http://www.youtube.com/watch?v=lb_h_mwKk-o
http://www.youtube.com/watch?v=Whq4uQl2lYI&NR=1
http://www.vectorvest.com/freemovies/demo/vectorvestproducttour/vectorvestproducttour.html

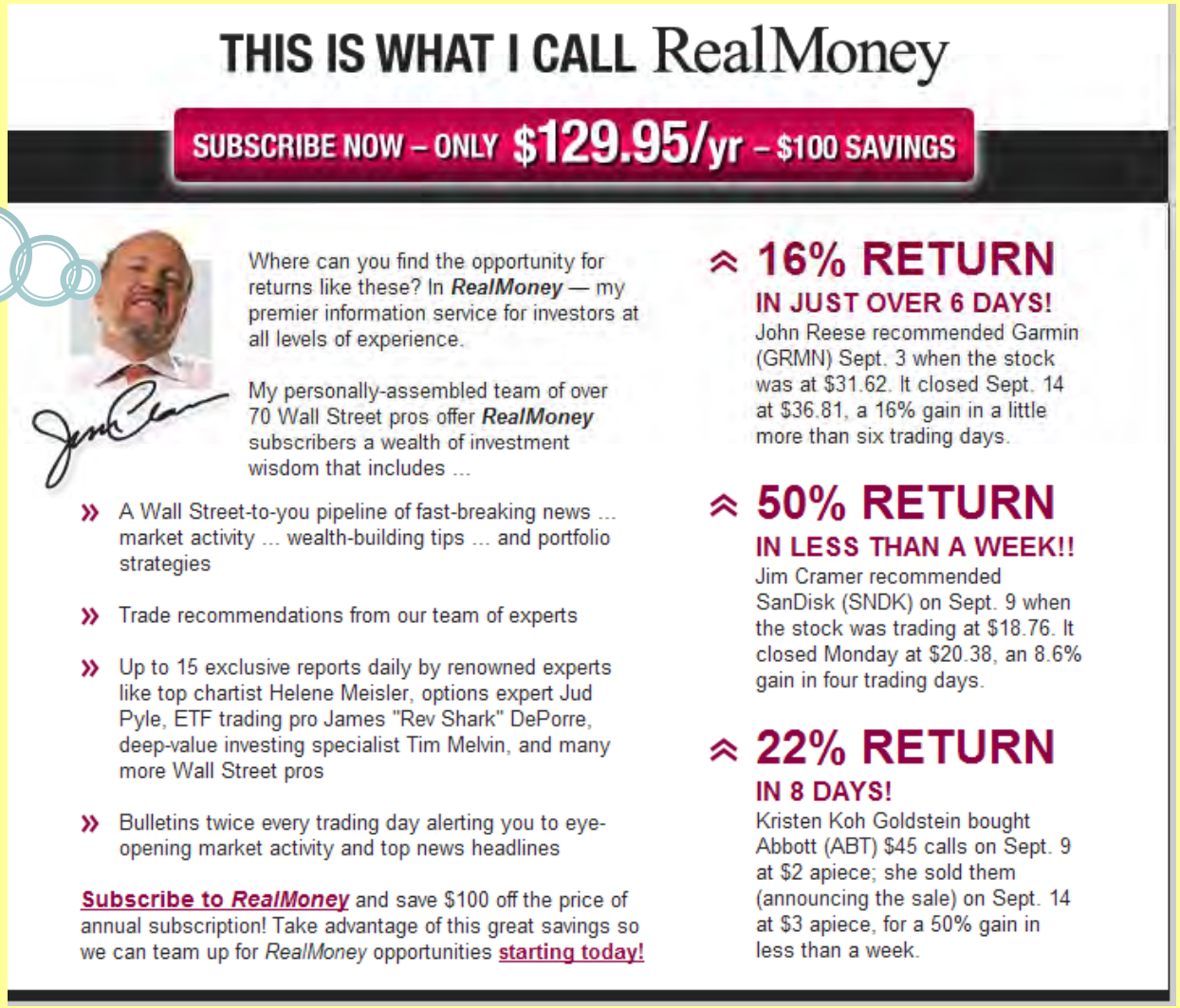


VectorVest Strategies

There are about 250 of these, tailored for different expectations about market performance.

Hmm...
What should we call the recommendations that **didn't** make money?

Maybe we should do some research

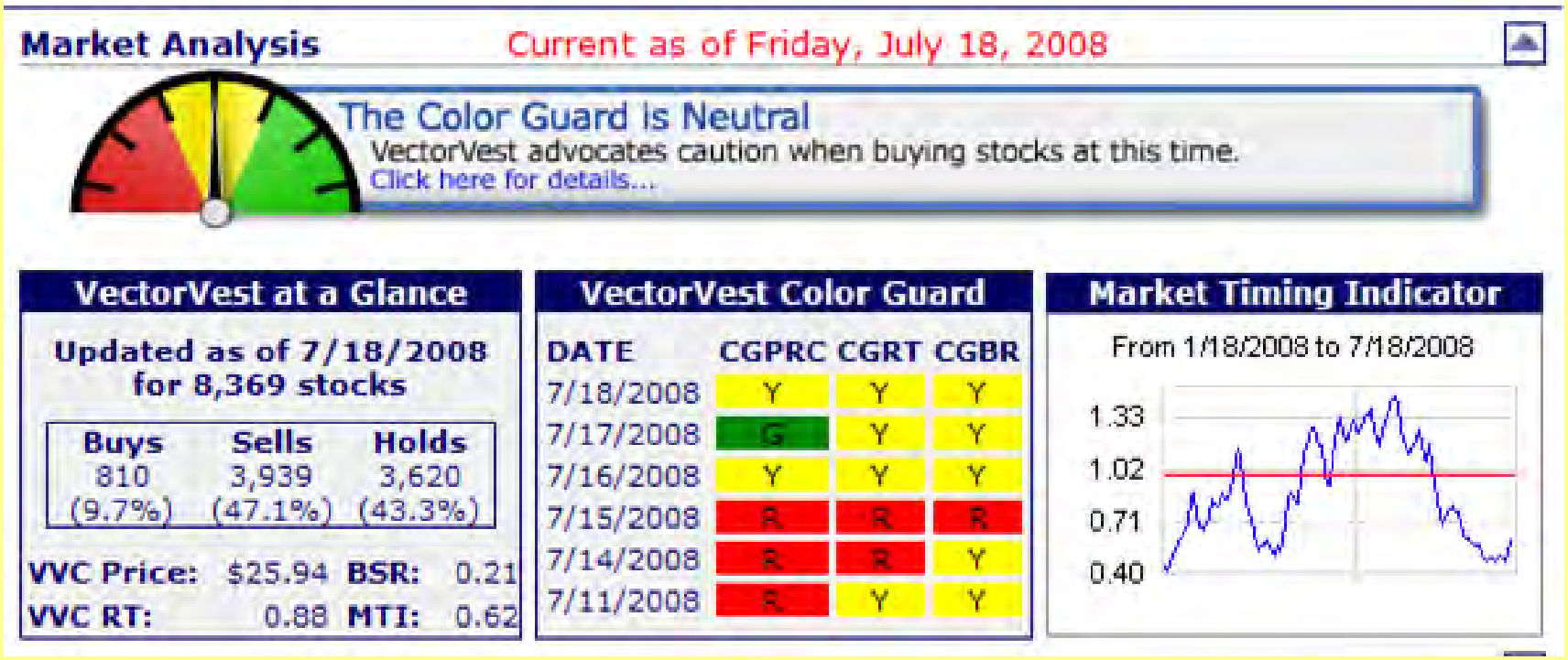


Strategy of the Week!

Suppose we sell a trading system with 250 strategies, and analyze the population every week to see which ones performed well.

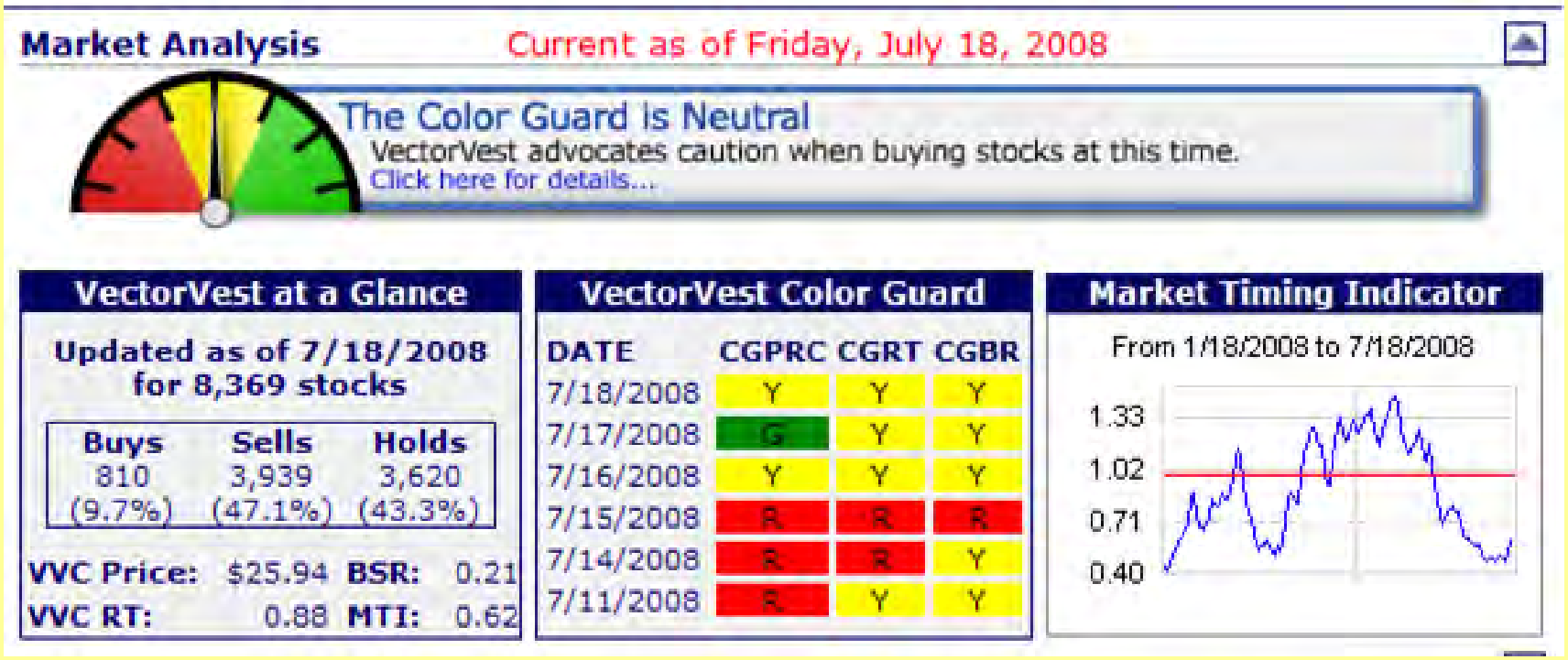
What if all 250 were no better than a Motley-Fool dartboard? How many should perform statistically significantly better than the market?

(Answer -- 12.5, at the p <= .05 level of significance)

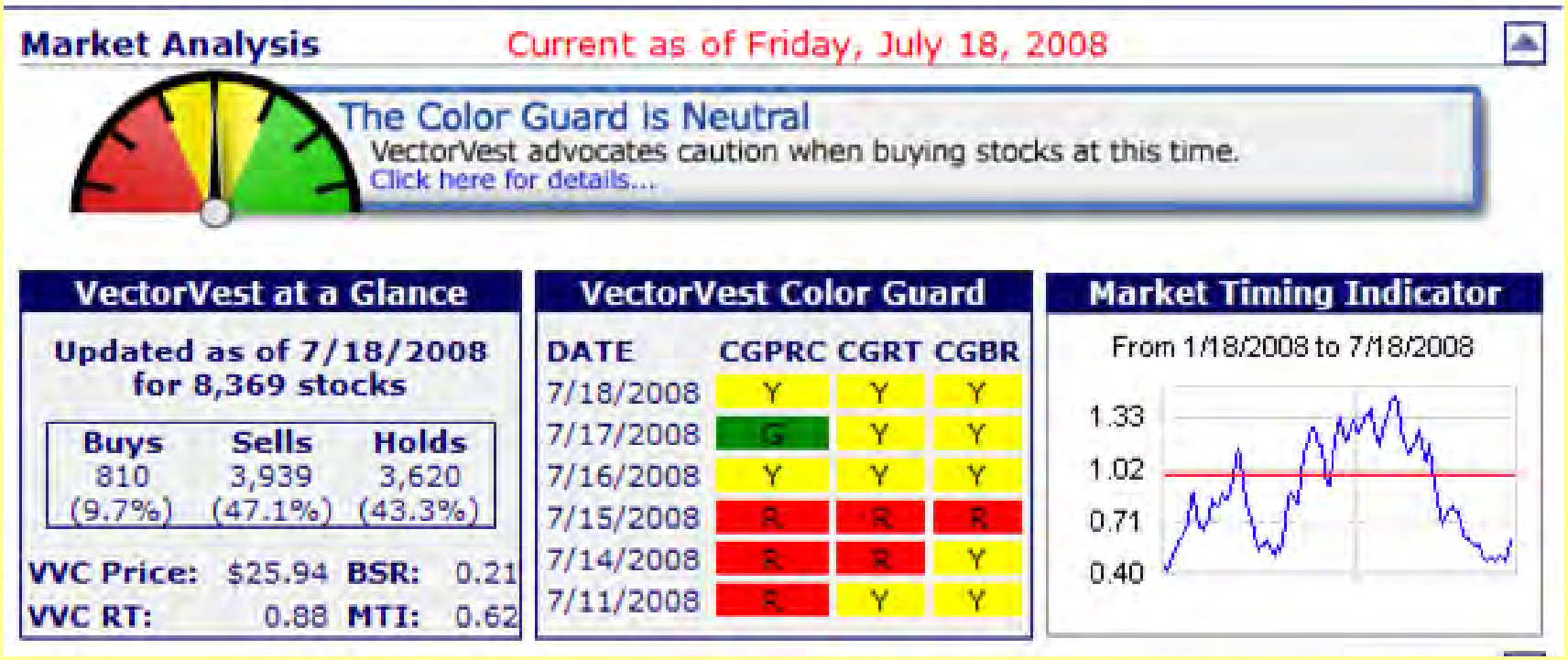


"COLOR GUARD" on the front page seems to be VectorVest's most unique and important feature. This box speaks to the overall timing of the market:

- VVC Price is the average price of the vector vest composite (the 8013 stocks in the VV database). They use it as an index, like S&P or Dow Jones
- VVC RT is the "relative timing" of the market. The market is on a rising trend for RT > 1 and a declining trend for RT < 1. Based on its published formula (ratios of random variables), I would expect this to have an odd probability distribution.

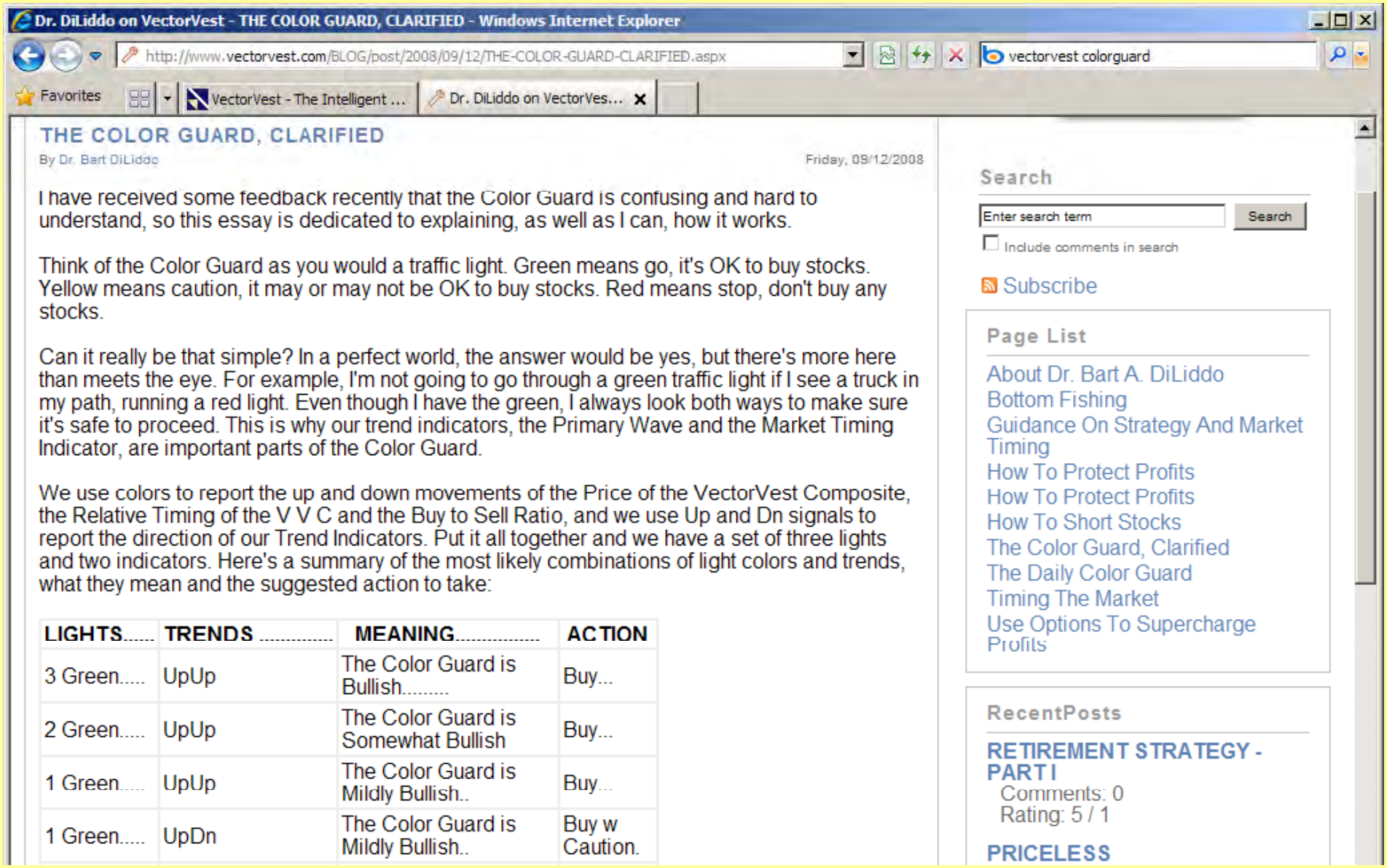


- BSR is the ratio of the number of stocks rated buy to the number of stocks rated sell in the VV database – ignoring the number rated hold. Suppose VV puts "hold" ratings on 8008 stocks, a Buy rating on 4 and a sell rating on 1, I would think this is a flat market, but with a 4-to-1 ratio of buys to sells (ignore the 8008 holds), BSR would have a value of 4.0, a seemingly huge value.
- MTI is the overall Market Timing Indicator and the is described in VectorVest tutorials as a key predictor in their system.



- The color system is summary of trends over the past few days / few weeks.
- According to VectorVest:
  - yellows mean there is no trend to follow,
  - red means the market is declining and you should NOT buy anything tomorrow, and
  - green means the market is rising and you feel good about buying.

VectorVest in their own words



THE COLOR GUARD, CLARIFIED

By Dr. Bart DiLiddo — Friday, 09/12/2008

I have received some feedback recently that the Color Guard is confusing and hard to understand, so this essay is dedicated to explaining, as well as I can, how it works.

Think of the Color Guard as you would a traffic light. Green means go, it's OK to buy stocks. Yellow means caution, it may or may not be OK to buy stocks. Red means stop, don't buy any stocks.

Can it really be that simple? In a perfect world, the answer would be yes, but there's more here than meets the eye. For example, I'm not going to go through a green traffic light if I see a truck in my path, running a red light. Even though I have the green, I always look both ways to make sure it's safe to proceed. This is why our trend indicators, the Primary Wave and the Market Timing Indicator, are important parts of the Color Guard.

We use colors to report the up and down movements of the Price of the VectorVest Composite, the Relative Timing of the V V C and the Buy to Sell Ratio, and we use Up and Dn signals to report the direction of our Trend Indicators. Put it all together and we have a set of three lights and two indicators. Here's a summary of the most likely combinations of light colors and trends, what they mean and the suggested action to take:

LIGHTS.....	TRENDS	MEANING.....	ACTION
3 Green.....	UpUp	The Color Guard is Bullish.....	Buy...
2 Green.....	UpUp	The Color Guard is Somewhat Bullish	Buy...
1 Green.....	UpUp	The Color Guard is Mildly Bullish..	Buy...
1 Green.....	UpDn	The Color Guard is Mildly Bullish..	Buy w Caution.

Search

Enter search term — Search

Include comments in search

Subscribe

Page List

About Dr. Bart A. DiLiddo
Bottom Fishing
Guidance On Strategy And Market Timing
How To Protect Profits
How To Protect Profits
How To Short Stocks
The Color Guard, Clarified
The Daily Color Guard
Timing The Market
Use Options To Supercharge Profits

RecentPosts

RETIREMENT STRATEGY - PART I
Comments: 0
Rating: 5 / 1

PRICELESS

VectorVest in their own words

3 Yellow....	UpUp	The Color Guard is Neutral.....	Buy w Caution.
3 Yellow....	UpDn	The Color Guard is Neutral.....	Buy w Caution.
3 Yellow....	DnUp	The Color Guard is Neutral.....	Do Not Buy.
3 Yellow....	DnDn	The Color Guard is Neutral.....	Do Not Buy.
1 Red.....	DnUp	The Color Guard is Mildly Bearish..	Do Not Buy.
1 Red.....	DnDn	The Color Guard is Mildly Bearish..	Do Not Buy.
2 Red.....	DnDn	The Color Guard is Somewhat Bearish	Do Not Buy.
3 Red.....	DnDn	The Color Guard is Bearish.....	Do Not Buy.

Given this array of light combinations, trends, meanings and actions, I can see why some people may be confused by the Color Guard. But here's how to make it real simple: IT'S ALWAYS OK TO BUY STOCKS WHEN THE PRIMARY WAVE IS UP.

The Primary Wave, shown on the left side of the Trends column, is discussed at some length in my essay of July 9, 2004. The Underlying Trend, shown on the right side of the Trend column, is discussed in my essay of July 23, 2004. A comprehensive review of our Market Timing System was presented in a series of seven essays from July 9, 2004 to August 20, 2004.

Comments: 0
Rating: 3 / 2

BUYING LOW AND SELLING HIGH
Comments: 0
Rating: 5 / 1

ON THE ROAD AGAIN
Comments: 0
Rating: 5 / 1

BECOME A GREEN LIGHT BUYER
Comments: 6
Rating: 3.4 / 19

VECTORVEST OPTION TOOLS
Comments: 0
Rating: 0 / 0

ONE DAY AT A TIME
Comments: 1
Rating: 3.7 / 3

THE YELLOW BRICK ROAD PORTFOLIO
Comments: 0
Rating: 5 / 1

MANAGING THE YELLOW BRICK ROAD PORTFOLIO
Comments: 0

from ... THE COLOR GUARD, CLARIFIED
Bart DiLiddo (VectorVest founder)

A little research

To study the ColorGuard system as a predictor of the market, I downloaded Standard and Poors' S&P-500 index prices from January 4, 1999* through early Sept 2009.

I then computed percentage price changes:

- percent gain or loss in the S&P compared to the current day
- percent gain or loss between the current day value and the value 5 trading days from the current day.
- after 15 trading days
- after 30 trading days.

I also looked at 2-day, 3-day and 4-day for some analyses, but the results were the same as 1-day and 5-day so I stopped bothering.

- The average day-to-day change in the market was 0.0027% (flat over 10 years)

---

* Available ColorGuard data appeared to start in late 1998

Results

1. Correlation between **RT** (relative timing) and future S&P index price was slightly **negative** (-0.034 for next-day price, -0.038 for 5-day, -0.019 for 15-day and 0.010 for 30-day).
   - The effect trends toward zero as you go further in the future (as a predictor of 30-days in the future). With over 2600 days of data, these tiny correlations are probably statistically significant, but it's a tiny effect.
2. Correlation between **Buy Sell ratio** and future price is -0.012 for next-day, -0.011 for 5 day, 0.018 for 15 day and 0.032 for 30 day.
   - Like relative timing, as an indicator for short term trading decisions, this is at best, worthless.
3. Correlation between **MTI** and future price is -0.025 for next day, -0.025 for 5-day (the same number is not a typo), -0.004 for 15 day and -0.016 for 30-day.

When these indicators predict "going up", the market on average goes slightly down.

A Few More Results

From 1999 to September 2009:

- 289 trading days rated **GREEN** / **GREEN** / **GREEN** (**GGG**) (**buy**)
- 285 rated **RED** / **RED** / **RED** (**don't buy**).
- After **GGG** days, S&P index went **DOWN** an average of
  - **-0.05%** the day after a **GGG** rating,
  - **-0.24%** five days after,
  - **-0.14%** 15 days after, and
  - **-0.33%** 30 days after.
- After **RRR** days, S&P went **UP** an average of
  - **0.24%** the day after an **RRR**,
  - **0.29%** five days after,
  - **0.42%** 15 days after and
  - **1.08%** in the 30 days after an **RRR**

Time to think about testing

Imagine these roles:

- individual investor trying to avoid making terrible mistakes and losing all her retirement money
- technical expert, hired by Securities & Exchange Commission to help them investigate stock-market related fraud
- analyst helping an investment firm assess effectiveness of investment strategies
- individual investor trying to assess effectiveness of investment-guidance tools ***that he is writing***
- analyst working at an investment firm that creates/sells investment-guidance tools:
  - writing the code
  - evaluating the usability and basic dependability of the product
  - evaluating the effectiveness of the product

These are all testing roles

Which tester gets the best pay?

Software testing

- is an empirical
- technical
- investigation
- conducted to provide stakeholders
- with information
- about the quality
- of the product or service under test

We design and run tests in order to gain useful information about the product's quality.

Empirical? -- All tests are experiments.
Information? -- Reduction of uncertainty. Read Karl Popper (Conjectures & Refutations) on the goals of experimentation

Testing is always a search for information

- Find important bugs, to get them fixed
- Assess the quality of the product
- Help managers make release decisions
- Block premature product releases
- Help predict and control product support costs
- Check interoperability with other products
- Find safe scenarios for use of the product
- Assess conformance to specifications
- Certify the product meets a particular standard
- Ensure the testing process meets accountability standards
- Minimize the risk of safety-related lawsuits
- Help clients improve product quality & testability
- Help clients improve their processes
- Evaluate the product for a third party

Different objectives require different testing tools and strategies and will yield different tests, different test documentation and different test results.

Three Information Objectives

1. Develop a strategy that maximizes profits
2. Verify that the code behaves predictably
3. Assess the profitability of one or more implementations (where "implementation" includes the strategy)

Basic concepts

- Let's define a "strategy" as a combination of three decision rules:
  - what to buy
  - when to buy it
  - when to sell it
- Many strategies require a human decision-maker applying human judgment.
- Whether by person or machine, all three decisions are
  - made under uncertainty, and therefore are
  - driven by random variables

A typical candlestick chart

- Prices on the top
- Volume on the bottom
- Shows:
  - High price for the day
  - Starting price
  - Ending price
  - Low price for the day
  - Bar is red if Start < End

- This chart shows:
  Royal Bank of Scotland
  Preferred stock, Series T
- On August 20, 2009,
  - Opened at $15.01
  - High at $15.29
  - Low at $11.27
  - Closed at $11.99
- On September 25
  - Closed at $14.02
- Wouldn't it be nice to
  - Buy at $11.99
  - and sell at $14.02?

Royal Bank of Scotland Preferred Series T

Preferred Stocks:

- Owned by shareholders (like common stock), but usually nonvoting
- Stock pays dividends at a (typically) fixed rate, comparable to paying interest on a debt
- This is like debt except that the company doesn't have to pay it back
- Dividends can be mandatory or discretionary
- RBS-Preferred Series T (RBS+T or RBSPRT)
  - discretionary, $1.812 per year ($0.453 per quarter)
  - sold for $25
  - at $25, $1.812 is 7.25% interest
  - at $11.99, 1.812 is 15.11%
    - (a HUGE dividend if you think RBS is a survivor)

Simplistic strategies

- Buy in the early morning (market open), sell at market close (in a generally rising market)
  - (How do you know if you're in a generally rising market?)
- Buy at close, sell the next morning (in a generally declining market)
- Buy a stock when it drops more than D% in one day and sell it back when the stock regains ½ of its loss
- Buy a stock when it hits a 52-week high and sell (a) after B% (e.g. 25%) rise or 10% trailing stop

These are probably all losers, but how can we tell?

Building a Model

1. start with a plausible hypothesis
   - in practice, this is the hardest step and the one that requires the most investigation
2. decide what data to test it on
3. get the data
4. what's the right test?
5. if the model proves itself wrong
   - study the fine grain of the data for evolution to next model
6. if model appears right
   - what replications are needed, on what data, to check this further?

1. Start with a plausible hypothesis

- in practice, this is the hardest step and the one that requires the most investigation
- For now, let's select this heuristic:

In a generally bullish period, buy at market open, sell at market close

(reflects market optimism?)

2. Decide what data to test it on

- Should we test on individual stocks or an aggregate?
  - If individual, should we sample from a specific pool (e.g. Wireless Internet stocks (think iPhone) might behave differently from consumer stocks like Taco Bell)?
  - How should we select from the pool?
- What time interval should we test on?
  - generally rising?
  - generally falling?
  - based on indicators (like consumer confidence)?
  - random?

2. Decide what data to test it on

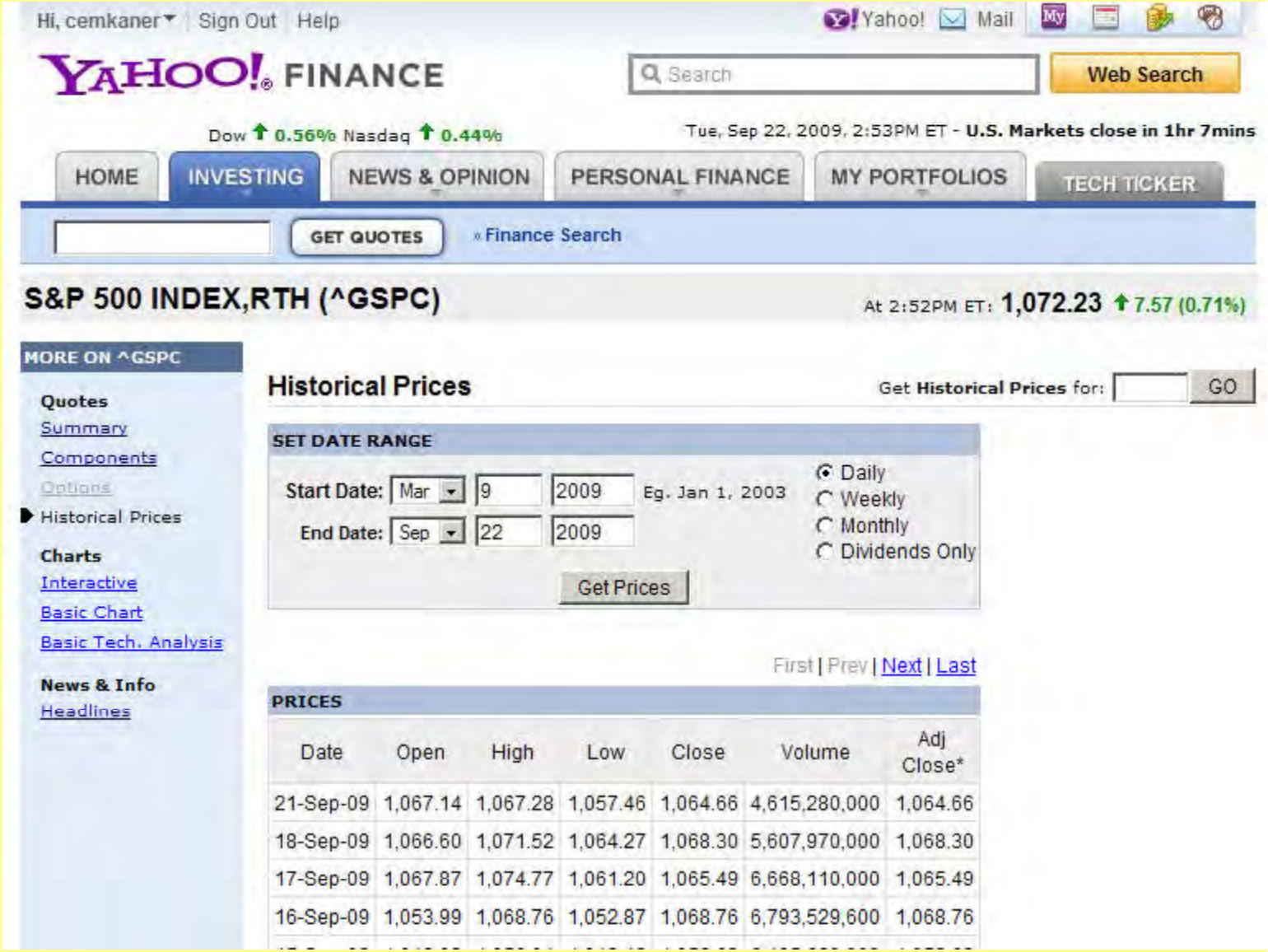
- To simplify our example, let's choose the Standard & Poors index
- from March 9 to present

3. Get the data

- In this case, getting the data is easy.
- Yahoo has it.

3. Get the data

- But how do we know that it's right?
- (This is a serious problem across different data sources. Examples in oral lecture.)
- HOW DO WE **GET** THE DATA?



4. What's the right test?

- My test is to calculate

  delta = Closing index value - Opening index value

  for every day in the time period

  and then calculate average delta per day

	A	B	C	D	E	F	G	H	I	J
1	Date	Open	High	Low	Close	Volume	Adj Close	CLOSE - OPEN	TOTAL	AVERAGE GAIN
2	9/21/2009	1067.14	1067.28	1057.46	1064.66	4.62E+09	1064.66	-2.48	407.27	2.97
3	9/18/2009	1066.6	1071.52	1064.27	1068.3	5.61E+09	1068.3	1.7		
4	9/17/2009	1067.87	1074.77	1061.2	1065.49	6.67E+09	1065.49	-2.38		
5	9/16/2009	1053.99	1068.76	1052.87	1068.76	6.79E+09	1068.76	14.77		
6	9/15/2009	1049.03	1056.04	1043.42	1052.63	6.19E+09	1052.63	3.6		
7	9/14/2009	1040.15	1049.74	1035	1049.34	4.98E+09	1049.34	9.19		
8	9/11/2009	1043.92	1048.18	1038.4	1042.73	4.92E+09	1042.73	-1.19		
9	9/10/2009	1032.99	1044.14	1028.04	1044.14	5.19E+09	1044.14	11.15		
10	9/9/2009	1025.36	1036.34	1023.97	1033.37	5.2E+09	1033.37	8.01		

table

5. If the model proves itself wrong

That didn't happen.

So we don't have to worry about it.

(yet)

6. If the model appears right

What replications are needed, on what data, to check this further?

- Replications on rising markets in previous years?
- Replications on falling markets?
- Replications on broader market (S&P is a 500-stock subset of 15,500 stock market)
- Replication across geographic segments (Chinese stocks? Israeli stocks? UK stocks?) (Do these add noise that should be chopped from our buying strategy?)

CAUTION: From my limited study, 2009 appears anomalous.

As far as I can tell, betting on this in the future is as likely to yield Boo Hoo as Woo Hoo.

1. But maybe we get a new hypothesis

Can we strengthen the predictable-rise-during-the-day hypothesis?

- study the fine grain of the data
- decide whether the hypothesis is wrong or incomplete
- if incomplete:
  - vary conditions as (potentially) appropriate
    - If the underlying theory is a daily rise due to optimism
      - » should we buy only when Consumer Confidence is up (we do have historical data)?
      - » should we focus on stocks recently upgraded by analysts?
      - » what else could enhance a general optimism, increasing its impact for a specific stock or industry or sector?
      - » What if we tried EVERY variable?

Strategy

At the core of each strategy is this maxim:

- Buy low
- Sell high

The challenge is that we can know the current price, but not the price in the future.

- How do we tell if a price is low,
  - relative to the price it will reach in the future?

Foundation of Many Strategies

- select a stock based on its inherent value
- select a buy rule based on its price momentum (do we think it's on the way up? **buy buy buy !!!**)
- select a sell rule based on price momentum (do we think it's going down? **sell sell sell !!!**)

- But how do we estimate inherent value?
- Or perceived value?
- Or momentum?

How do we estimate value?

- Estimated value is a random variable
- A strategy may do poorly empirically if estimated-value overestimates actual value
- If we don't know the distribution of the estimator, how can we decide whether the success or failure of a transaction stemmed from:
  - **poor model**
    - poor relationship between our notion of "value" and future price
  - **poor estimator**
    - our concept of value is good, but we don't estimate it well
  - **variability that resulted in a biased selection**
    - our estimator is OK, but the underlying distributions are skewed and most trades will fail (lose money or gain too little)
  - **poor timing**
    - (e.g. bad luck) (e.g. overriding broad market trend)

How do we estimate the value?

VectorVest model: DiLiddo, Stocks, Strategies & Common Sense, p. 22

V = 100*(E/I)*SQR[(R+G)/(I+F)] where

- V = stock value in $ per share
- E = earnings per share in $ per share
- I = AAA Corporate Bond Rate in percent
- ROTC = Return on Total Capital in percent
- R = I * SQR(ROTC/I)
- G = Annual earnings growth rate in % per year
- F = CPI inflation in % per year

How many random variables are here? How many ratios of random variables? What is the distribution of V?

What is the distribution of V?

Q: What's the big deal? Can't we just assume the distribution of V is "normal"?

A: You can assume anything you want, if you don't mind being wrong and losing all your money.

Why do we care about the distribution?

If V is a random variable:

- How should we best estimate its central value?
  - mean? median? mode? Why?
  - The basic shape of the distribution (e.g. skew) is important for this
- How can we decide whether an extreme-looking value is an "outlier" (a mistaken observation) or a legitimate datum that should be used in our calculations?
- How can we decide whether a pattern of behavior is expected or unexpected?
- How can we decide whether a change in stock price reflects simple random variation, or a change in underlying value?

Ratios of Random Variables are Badly Behaved

- In your statistics classes, you probably studied the distributions of sums of random variables, but not ratios
- You probably worked with a ratio variable: the F distribution. Try to remember how oddly it was shaped.
- Ratio variables often have
  - thick tails (distant-from-mean data that look like outliers)
  - skew

Good luck deriving the distribution

If we want to include distributional shapes or parameters in our models, we will probably have to get them via simulation.

Timing Variables

- The first derivative of a function measures its speed, for example how quickly the price changes
- The second derivative measures its acceleration. A simple linear function has no acceleration, just growth. A square (x^2) accelerates linearly. A logarithm is decelerating.
- The third derivative measures "jerk" -- rate of change of acceleration. It's interesting to consider jerk as a way of looking at impact of analyst recommendations, earnings announcements and other events that happen relatively few times per year.

RBS-T illustrates big changes over time

Distributions of Timing Variables?

Now, think about the timing variables:

- If we measure change only with respect to time, rates of change seem like a relatively simple measure (except for nonstationarity).
- It is common to derive the probability distribution of a function of a random variable, for example the distribution of the mean, the skew (symmetry), and the kurtosis (relative thickness of the tails) of the distribution
- I'm not sure it's easy to derive the probability distribution for a random variable that derives its value from another random variable by being its derivative.
- Additionally, we often measure change of a **ratio** (e.g. price to earnings) (price to book value), (growth to R&D expense)

Stationary Distributions

A random variable has a stationary distribution if its statistical properties (distributional shape and parameters) do not change over time.

- Our variables are probably nonstationary (e.g. population-mean price probably changes over time)
- Our variables might have mixture distributions (multiple distributions in play at the same time)
- Our variables also often have high jerk values (3rd derivative, rate of change of acceleration) at predictable times (earnings announcements, dividend announcements, ratings announcements by key analysts)

RBS-T mean seems to vary over time

And big changes that might be nonrandom

Why the big drop in RBS-T (8/20/09)

Aug 20 - Fitch Ratings has downgraded the ratings of hybrid securities at Lloyds Banking Group plc (LBS), Royal Bank of Scotland Group plc (RBS), ING Group, Dexia Group, ABN Amro, SNS Bank, Fortis Bank Nederland and BPCE and certain related entities. The downgrade reflects increased risk of deferral of interest payments after the European Commission (the "Commission") clarified its stance on bank hybrid capital, and in particular the application of the concept of "burden-sharing". A full list of ratings actions is available at the end of this commentary.

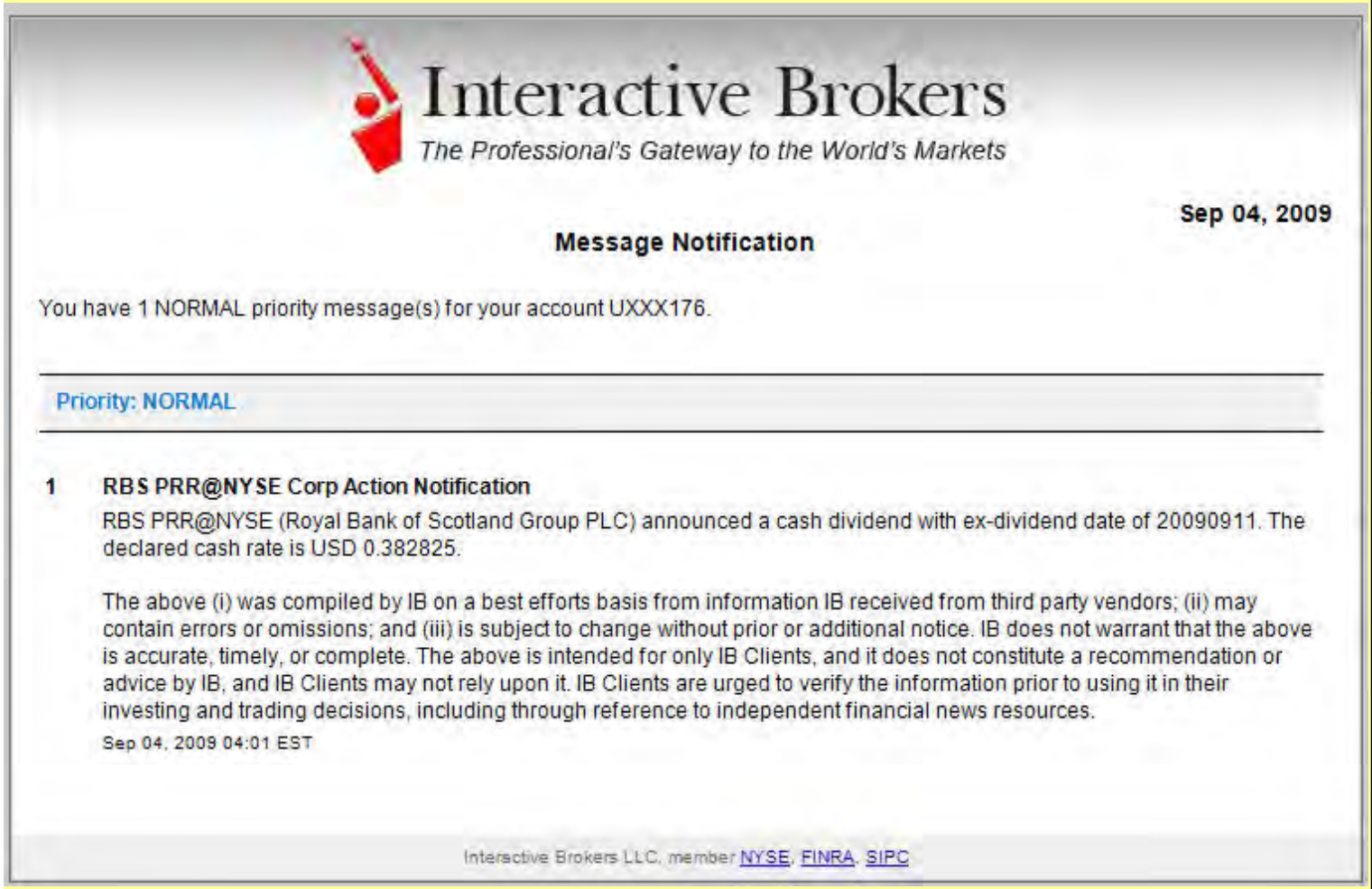
The Commission's recent statements confirm Fitch's view that government support for banks may not extend to holders of subordinated bank capital (see 4 February 2009 comment "Fitch Sees Elevated Risk of Bank Hybrid Coupon Deferral in 2009" on www.fitchratings.com). Fitch has already taken significant rating actions on the hybrid capital instruments of ailing banks within the EU and elsewhere. Nevertheless, in the light of the latest Commission statements, Fitch is applying additional guidelines in its ratings of hybrid capital instruments issued by EU financial institutions. These are outlined in a report published today, entitled "Burden Sharing and Bank Hybrid Capital within the EU." A second report; "UK Banks and State Aid: "A Burden Shared", which is also published today, discusses the implications for bondholders of UK banks that have received state aid.

In particular, Fitch would highlight that a bank that has received state aid and is subject to a name-specific restructuring process will likely have a hybrid capital rating in the 'BB' range or below, with most ratings on Rating Watch Negative (RWN), indicating the possibility of further downgrades. Banks which Fitch believes are subject to significant state aid beyond broad-based confidence building measures will likely have a hybrid capital rating in the 'B' range or below, and be on RWN. Fitch will apply these guidelines to banks where a formal state aid process has not yet been established, but where Fitch believes such a process is likely to arise. ...

The securities affected are as follows: The Royal Bank of Scotland Group plc -- Preferred stock downgraded to 'B' from 'BB-' and remains on RWN (and a bunch of other banks)

Information inequity causes mixture distributions

Also, a Mixture Distribution (RBS 9/4/09)



Interactive Brokers

The Professional's Gateway to the World's Markets

Sep 04, 2009

Message Notification

You have 1 NORMAL priority message(s) for your account UXXX176.

Priority: NORMAL

1 **RBS PRR@NYSE Corp Action Notification**

RBS PRR@NYSE (Royal Bank of Scotland Group PLC) announced a cash dividend with ex-dividend date of 20090911. The declared cash rate is USD 0.382825.

The above (i) was compiled by IB on a best efforts basis from information IB received from third party vendors; (ii) may contain errors or omissions; and (iii) is subject to change without prior or additional notice. IB does not warrant that the above is accurate, timely, or complete. The above is intended for only IB Clients, and it does not constitute a recommendation or advice by IB, and IB Clients may not rely upon it. IB Clients are urged to verify the information prior to using it in their investing and trading decisions, including through reference to independent financial news resources.

Sep 04, 2009 04:01 EST

Interactive Brokers LLC, member NYSE, FINRA, SIPC

I got this note from IB at 4 am on 9/4. This news didn't show up at several other brokerage or news sites until end of day or next day (or later).

So, some people are buying on the news that dividends are coming. Others are selling because they think dividends are not coming.

So how do we model this?

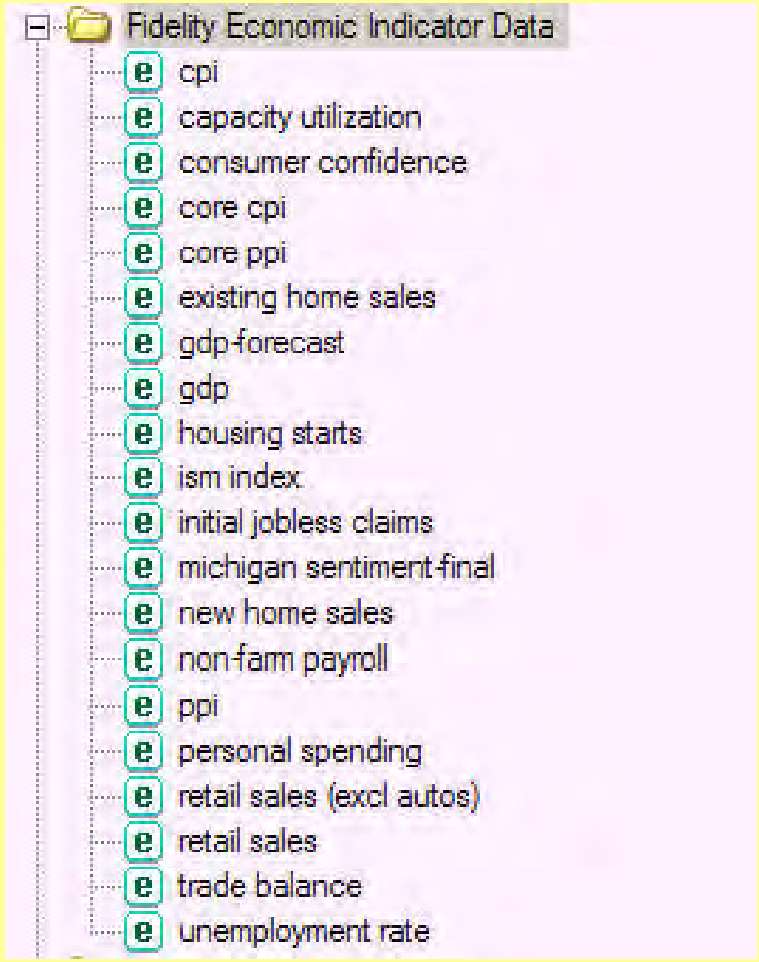
- My preference is to look at the fine grain of the data, for interactions among several variables that :
  - haven't been studied well enough together (combine "fundamental" and "technical" variables)
  - are predictive under a narrower set of circumstances than all stocks (or all stocks in a sector) or at all times
- We have hundreds of potentially available variables to work with.
- Their values are all probabilistic
- Some variables will be better predictors than others.

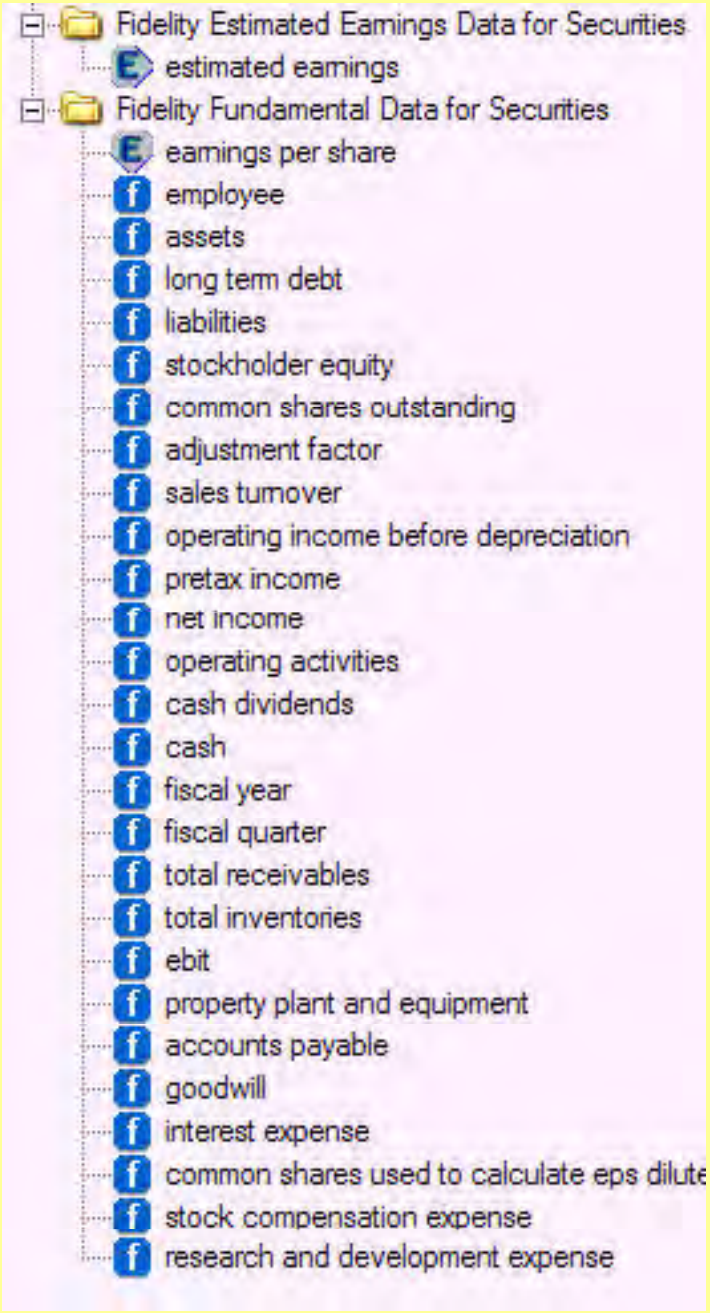
So how do we model this?

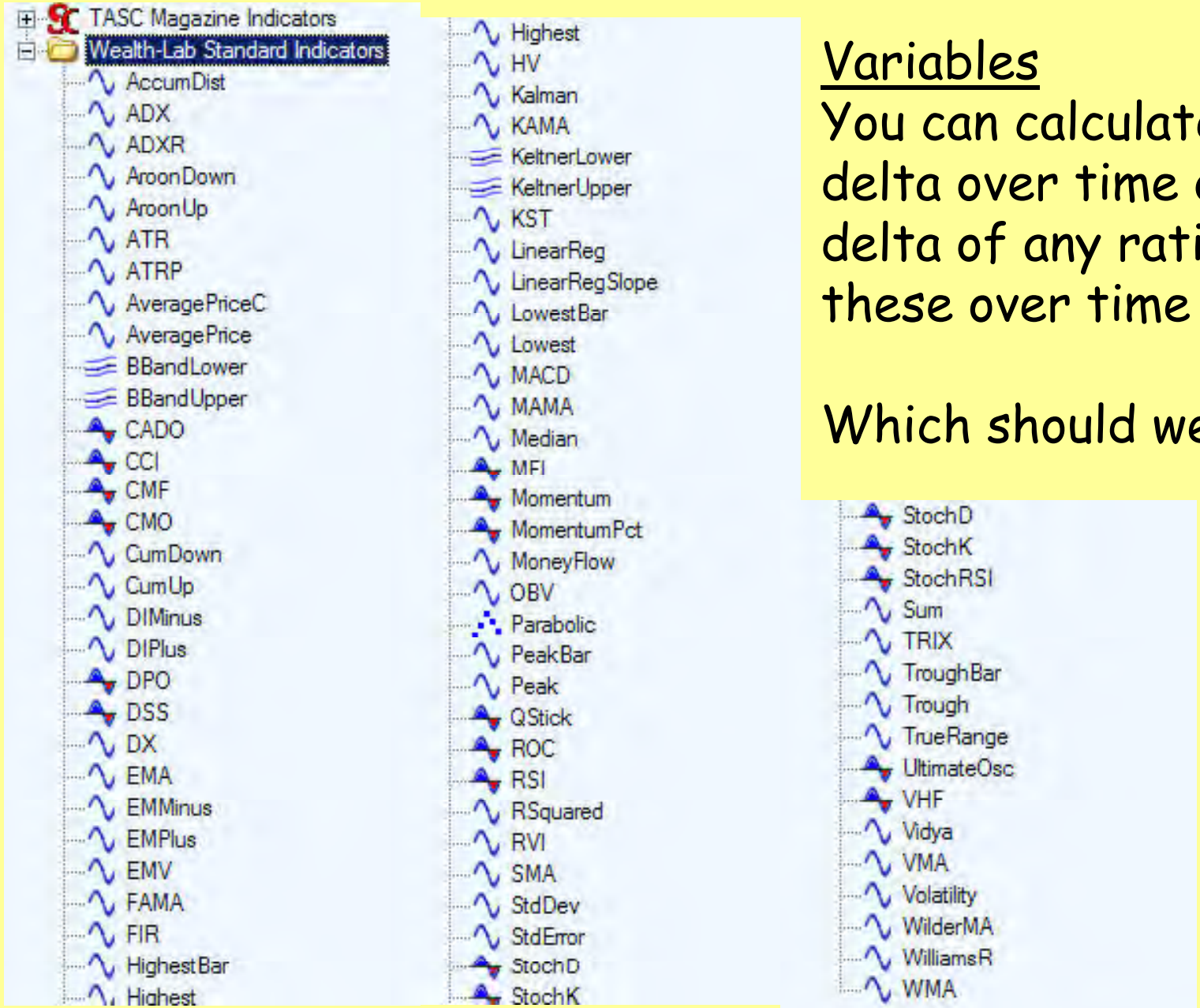
- So, how do we:
  - decide which variables might be relevant?
  - assess their effectiveness as predictors?
  - distinguish between variability, covariation with other predictors, and irrelevance?
- We can get historical data for many of these variables from the public web, larger collections from VectorVest (very detailed collection of historical data), Fidelity WealthLab (an awesome collection) and probably other sites.

Variables Available in Fidelity WealthLab:

You can find values for almost any point in time





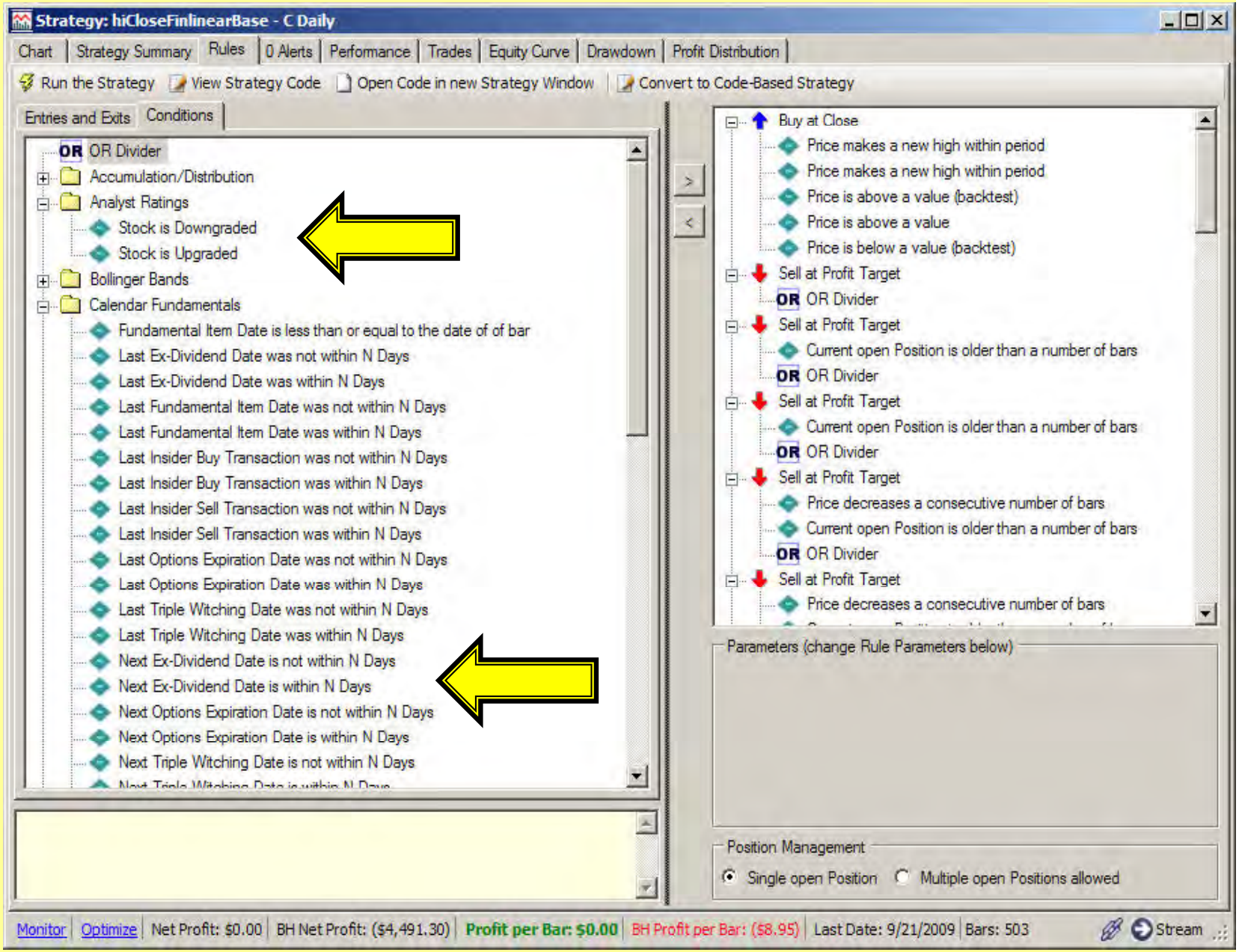


Variables

You can calculate any delta over time or any delta of any ratio of these over time

Which should we look at?

Even more Wealth-Lab data



Random Choices

- If we select individual stocks, should we select ALL of them or some?
- If we want to check stratification across industries or sectors, should we compare all of them or some?
- If we test across dates, should we select all of them or some?
- If some, should we:
  - handpick each case?
  - lay out some criteria and sample randomly from them?

Beware of experimenter effects

Random Sampling

- protects against biased selection of individual ranges of data or individual stocks
  - essential when dealing with historical data because you know what happened
- provides a rationale for replication on "essentially the same" data set
- allows computerized decision-making, i.e. rapid and automated selection, and then rapid replication
  - you certainly need ***that*** if you're going to check the covariation between delta(close-open)) and each of umptybuzzilion other variables

Remember: Probabilistic Overload

Suppose we identified 100 variables of interest, and tested each to see whether values of that variable had a statistically significant relationship with the trading opportunity that we're studying (delta (open-close)).

Parametric statistics are maybe not so good here (what are the distributions of the random variables of interest?), but there are plenty of distribution-free tests.

Suppose there really is no delta(open-close) effect.

- How many variables should give us statistically significant predictive patterns?
- (Answer: 5% at the p <= 0.05 level)

False Positives

Type 1 Error:

- It looks like
  - a highly predictive variable
  - an awesome strategy
- but it isn't

Type 2 Error:

- It looks
  - completely unpredictive
  - a losing strategy
- but we are missing the relationship that is actually there

Any screening study can yield errors of both types.

Screening for predictive quality

Screening for predictive relationships is just screening, not proving.

If we want a heuristic good enough to bet our money on, I think we need

- more extensive replication,
- discovery of conditions under which the variable (or strategy) is ineffective, and
- a rationale that allows us to make (and test) predictions that make sense.

Closing Thoughts -1-

Thinking specifically about testing:

- Many people get trapped in a mental box that says

  "test automation Ξ automated execution of regression tests"

- In previous talks, I've emphasized "high volume test automation" as applied to such areas as telephony, printer firmware and other embedded control systems, and assessment of mathematical computations.
  - Lots of test automation, but no regression testing
- In this talk, we see testing as an analytic activity that helps the other stakeholders understand the subject matter domain (here, investing), the models they are building in it, and the utility of those models and the code that expresses them
  - Lots of test automation, but no regression testing
- Rather than letting yourself get stuck in an overstaffed, underpaid, low-skill area of our field, it makes more sense to ask how, in **this application's** particular domain, we can use tools to maximize value and minimize risk.
  - High value test automation, probably not much regression testing.

Closing Thoughts -2-

- A computer program is not just "a set of instructions for a computer." It is an attempt to help someone do something. The program:
  - makes new things possible, or
  - makes old things easier, or
  - helps us gain new insights, or
  - brings us new experiences (e.g. entertainment)
- When we study "computing" as a general field (or software testing) (or software engineering) we often abstract away the underlying complexities of the subject matter we are working in.
- The alternative I illustrated today focuses on the subject domain (today, investing) and studies computing as a tool to help with that domain's challenges rather than the subject as a vague source of examples to support generic principles. I think this is the path to value (and income) in companies that see computing as supporting technology (i.e. most companies)(and most government agencies).