Forecasting Market Price Movements with System Dynamics

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Client Description

Client: Jantz Morgan

- An investment management firm

- Maintains an investment portfolio that they rebalance at the beginning of each month based on the predictions for that month of a System Dynamics model

- Would like a model that explains market movements that defy rational valuation methods

Our concept of how the market works

From Traditional Finance and Behavioral Finance Theory we defined three types of investing styles:

- Value: trade on intrinsic value of stock/firm
- Technical: trade on price and volume movements
- Psychological: trade on buzz

Balancing and Reinforcing effects of these styles:

- Value trading tends to bring prices to a stable value
- Technical and Psychological trading tends to reinforce price changes (Momentum trading)

Interacting with Clients

Our belief:
Client has a model that predicts how a rational market works
Thus, they have successfully modeled the value loop
Our job is:
- to find forcing and delay factors that make the value loop appear irrational
- to add loops to that model to include irrationality

Client:
Unwilling to show us their proprietary model
Described a potential reference mode that shows market irrationality: monthly rank reversal

Modeling

Methodology:
Focus on single examples of each investing style:
- Value Investment loop: driven by P/E ratio
- Technical Investment loop driven by price changes and volume
- Psychological Investment loop driven by number of articles written about a given stock

Results:
- Using these loops we were able to generate a monthly reversal in price
- Not confident in the results

Challenges

Defining a phenomena that can be modeled
- Important phenomena occur on a wide range of time scales
- Client demonstrated “rank order reversal” (apparently statistically significant)
- Monthly reversals in price are the exception, not the rule

Price is the easiest thing to observe; partially for this reason we made it central to our model
- Price is not the main driver of momentum trading

Market workings are not transparent
- Data for table functions

Unable to correctly weight the styles of investing

What we've learned about modeling the market

More difficult to get data than we had imagined

- Much of the data is not public
- Public data exists in multiple sets of accessibility

Volume and liquidity are central to market functioning

Keep the model as simple as possible and never model alone

What we've learned about the Client

Client:
• Does not have a model of how the market works, instead they have a model predicts that intrinsic value
• Client model is very simple (few loops) but data rich
• Client believes very strongly in the model and the model has performed well using historical data

Client Problem:
• At small scale, trading costs reduce returns
• To continue to show returns, fund must grow to past a threshold size
• To grow, investors require a track record
• To build a track record, fund must have investors

Client needs to pursue sales and marketing more
Should be willing to give up more of their upside to build the fund

Future Work on this topic

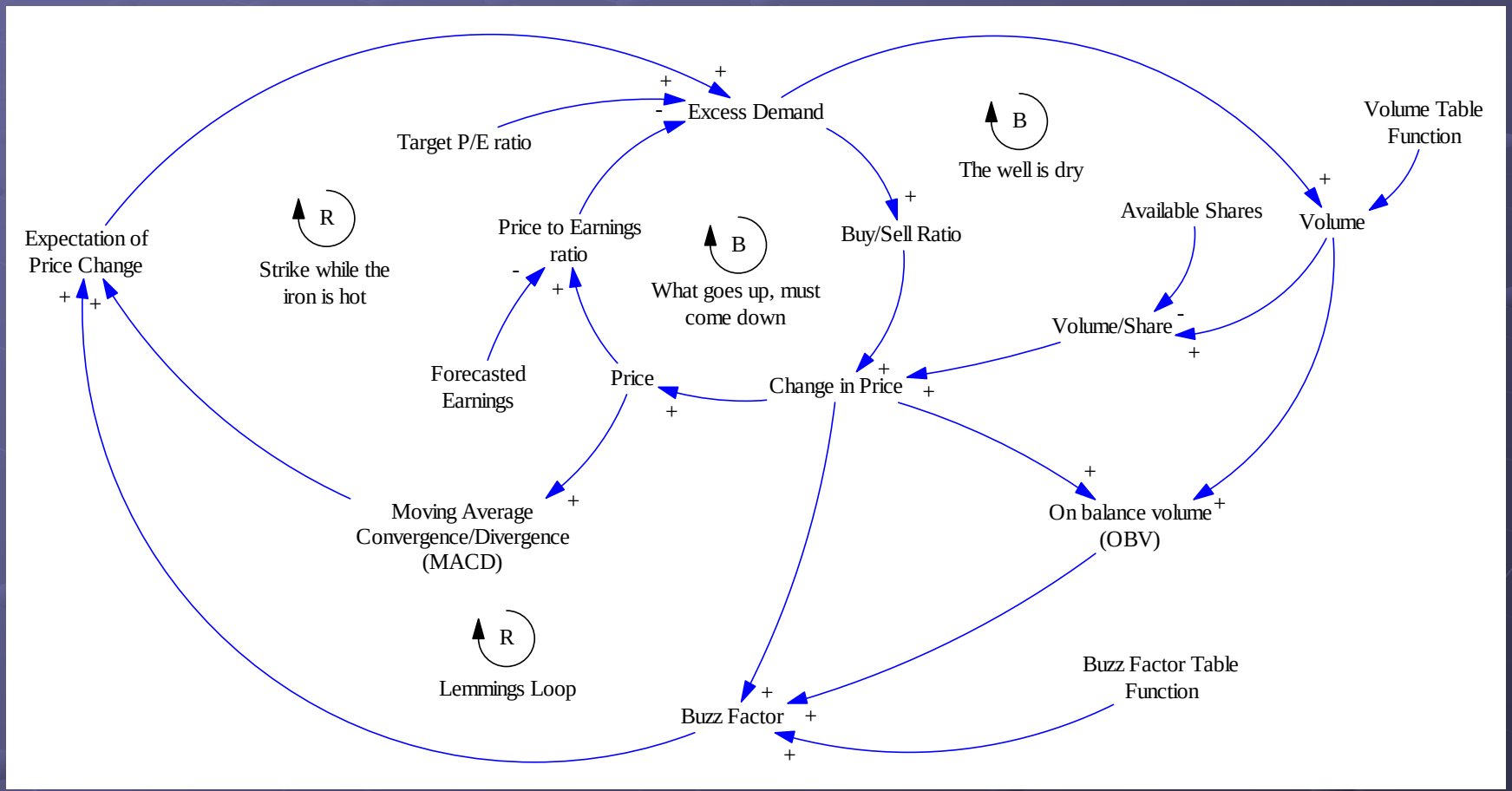
Access to data
•Table functions incomplete
• Work with a brokerage company so as to get access to all public data

Expanding the Model
• Impact and growing importance of trading due to hedging

Setting the time frame
• Better understanding of how much time it takes for components to interact consistently

Consider speculative trading as exogenous

Model


Excess Demand
Target P/E ratio
B
The well is dry
Volume Table Function
Volume
Available Shares
Buy/Sell Ratio
R
Strike while the iron is hot
Expectation of Price Change
Price to Earnings ratio
B
What goes up, must come down
Volume/Share
Forecasted Earnings
Price
Change in Price
Moving Average Convergence/Divergence (MACD)
On balance volume (OBV)
R
Lemmings Loop
Buzz Factor Table Function
Buzz Factor