Assessing Symmetry and Efficiency in Markets by Length Trend Analysis

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Economical Systems are Complex Systems:

In particular Financial Markets are formed by a huge number of traders interacting in a complicated way.

----> Emergent properties ----> Emergent Statistical Properties Stylized facts):

Fat tails
Gain/loss asymmetry
Absence of linear autocorrelations (returns)
Clustering volatyliity
Etc

The Efficient Market Hypothesis (EMH):
Market determines instantly the more rational price of a traded asset.

Samueson demostrated it (under the hypothesis of rational agents):

The best forecast of the future price is the present price
$E(S(t+\Delta t)| S0,,...,S(t-\Delta t),St) = St$

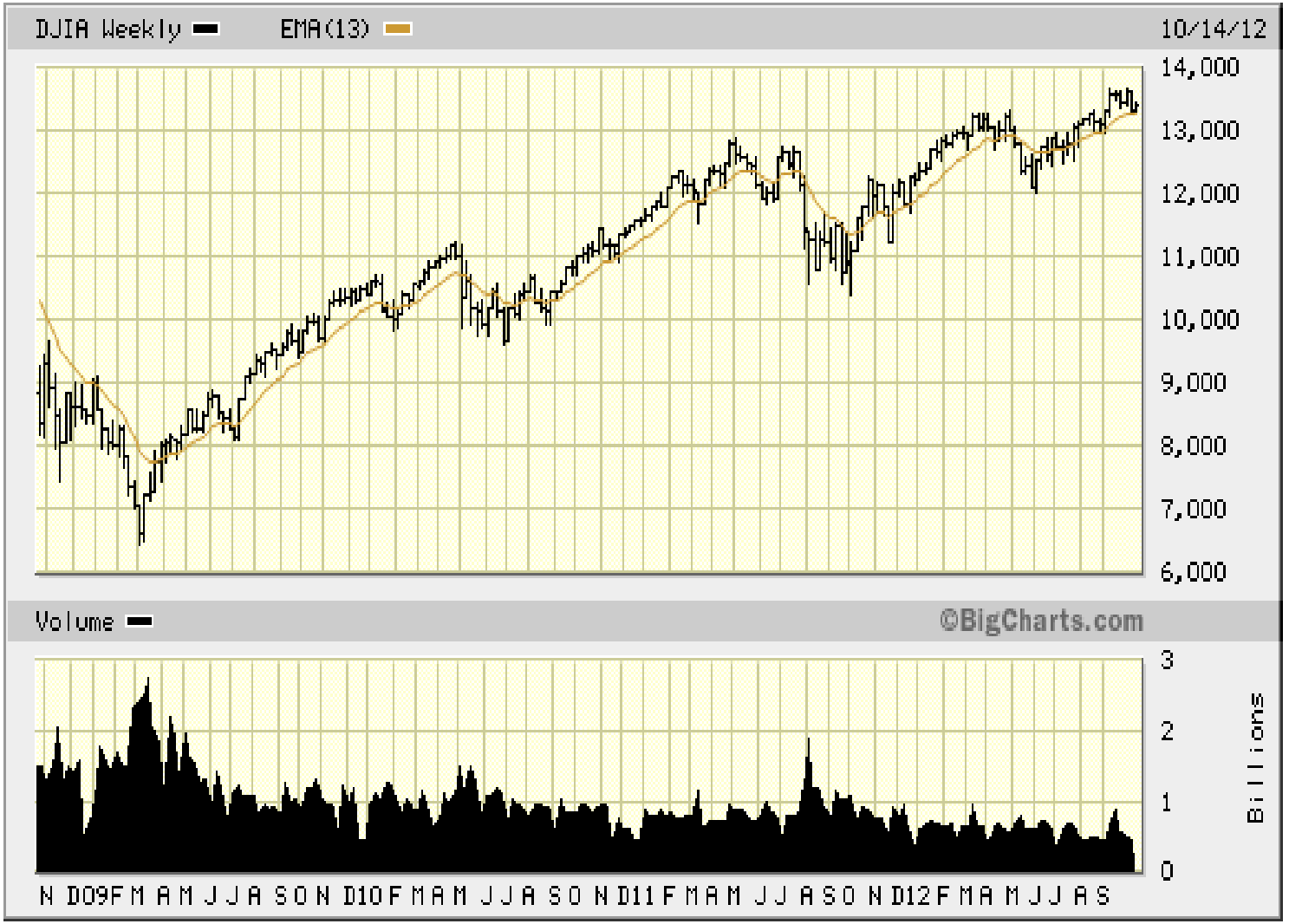
St = price at time t.

Markets go up or down during certain time periods in trends.

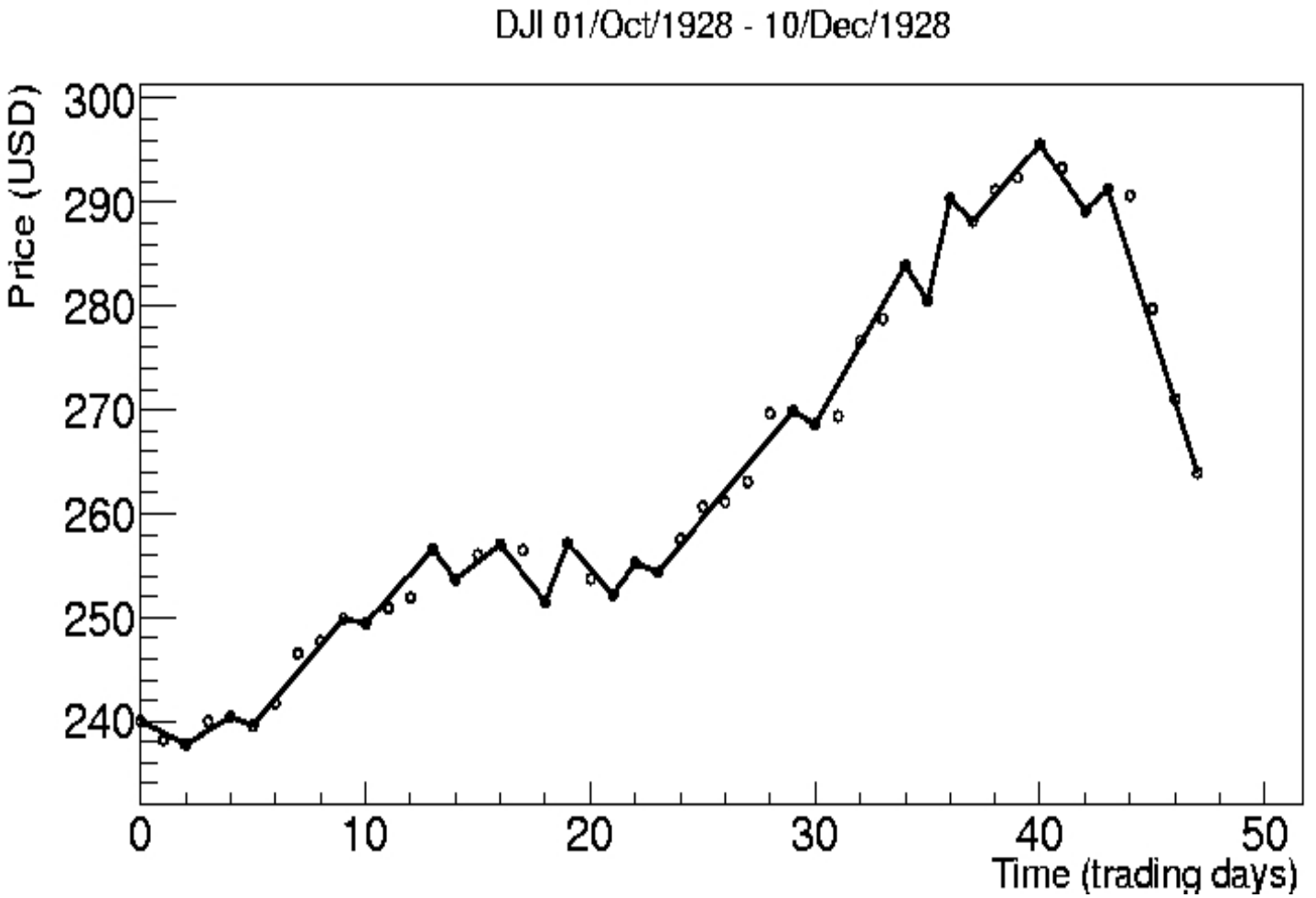
Definition:
An elementary uptrend of duration k will be defined as a subseries
Of k+1 values within the series St in which every value is greater than than the preeceding one.

Analogously, we define a elementary downtrend (with < and =).

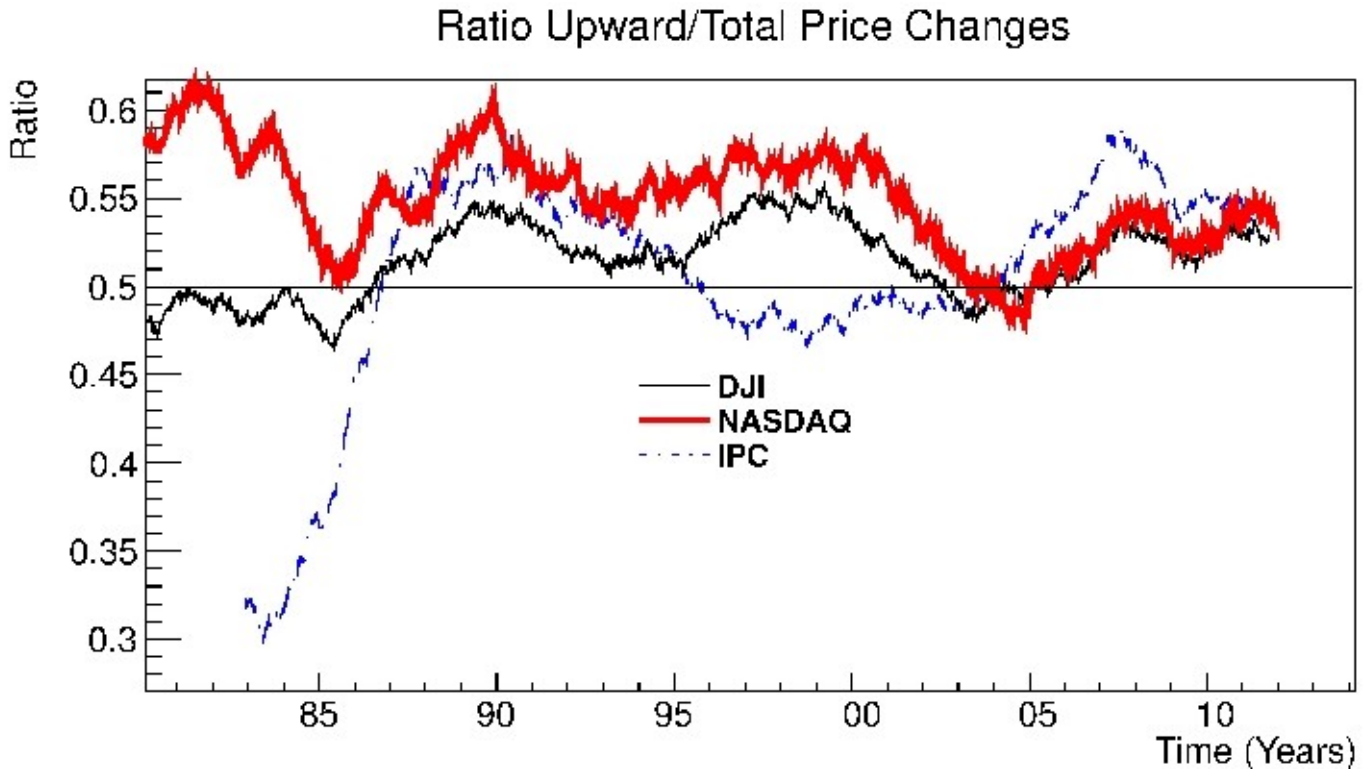
Dow jones index. 5 years



The market for some periods move in trends



The line segments join the starting and ending points of each elemental trend



Ratio of upward to totalnprice change in daily data, plotted against time. 1980-2011. Calculated on a time window of 1000 days.

Following the efficient market hypothesis:

At every time step, there are two possible outcomes:
the price either increases or not increases

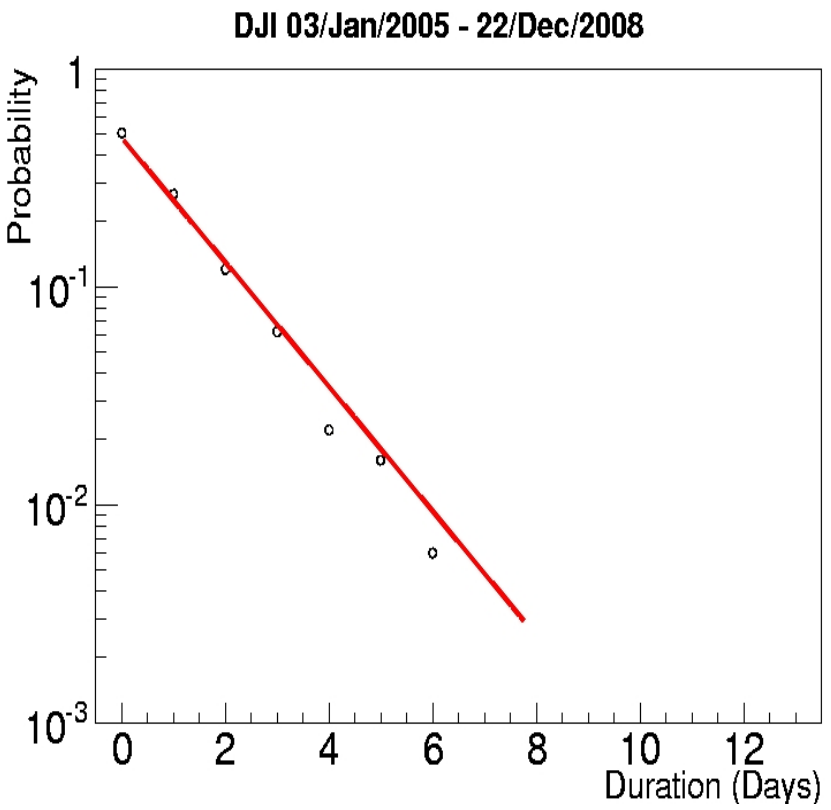
The distribution of the number k of failures needed to get one success
In a Bernoulli process with success probability p us:

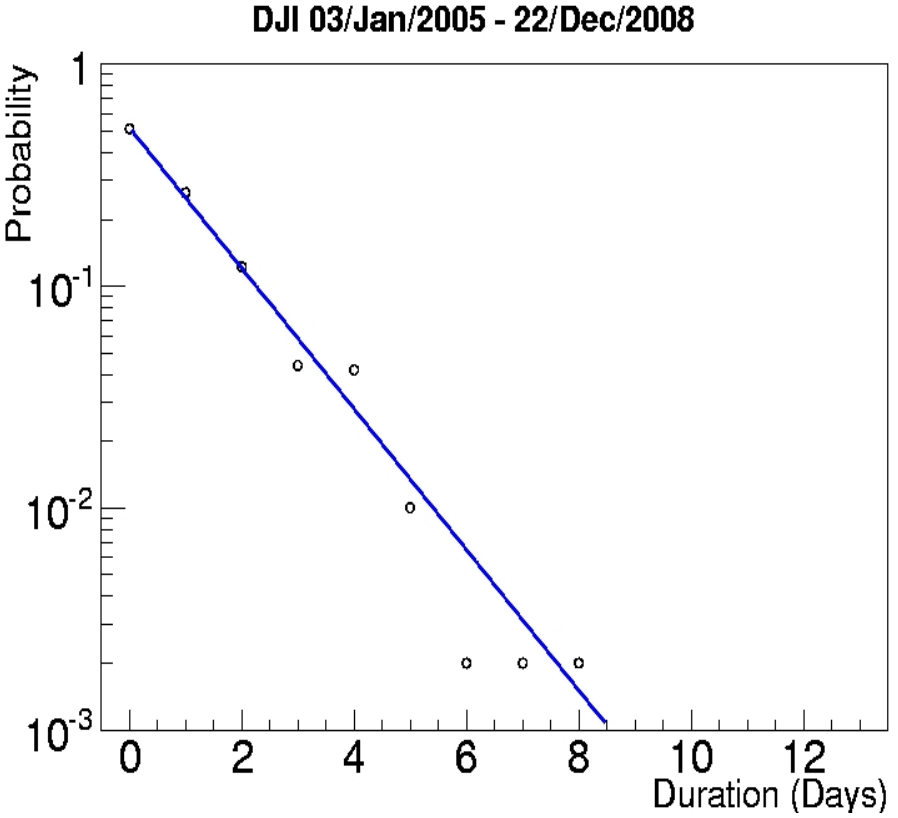
$P(k) = p(1-p)^k$

The duration of a rising trend in daily data is the number of of days that it is necessary to observe going up the market before the price decreases.

Also p= 0.5

Distribution of trends durations: DJIA



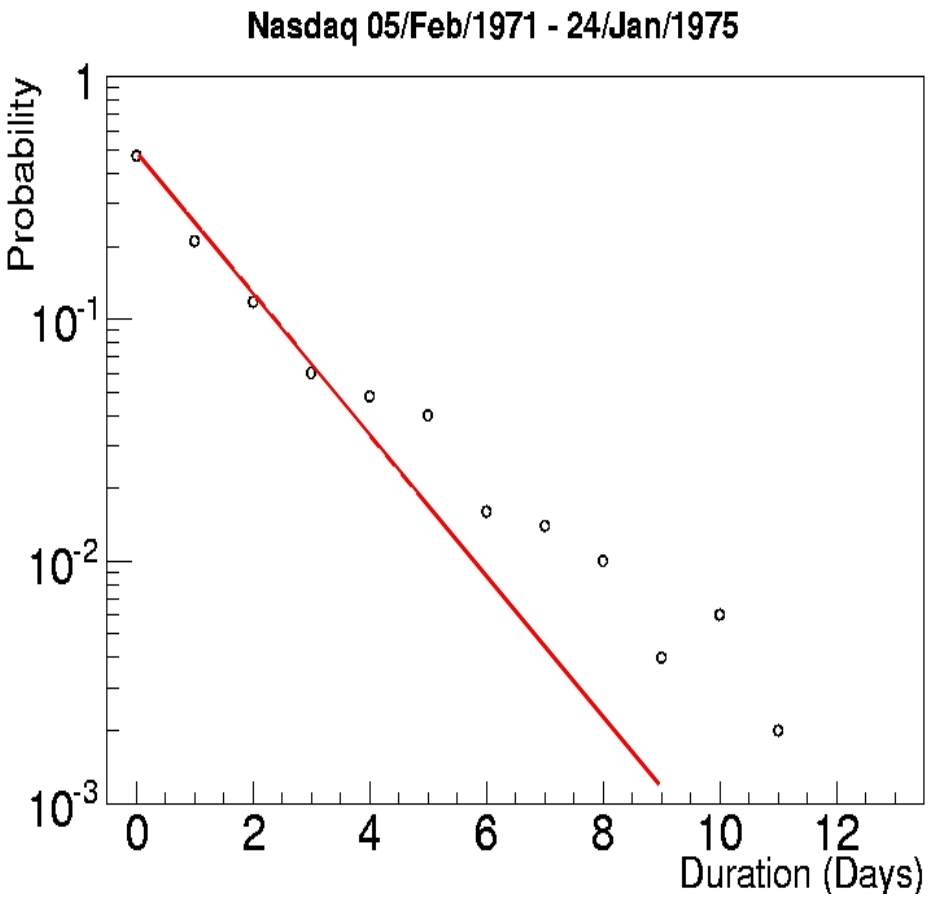


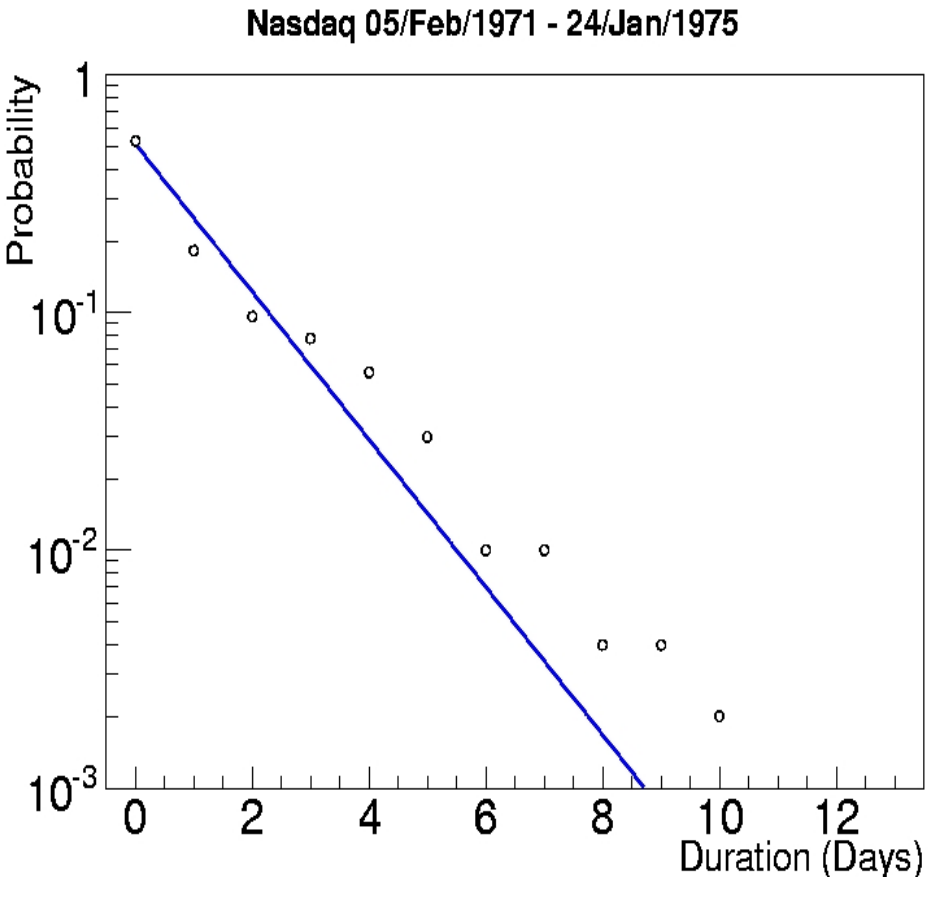
P = 0.518

P = 0.482

Left uptrend, right downtrend. Line: expected geometric distribution.

Distributions of trends durations: Nasdaq

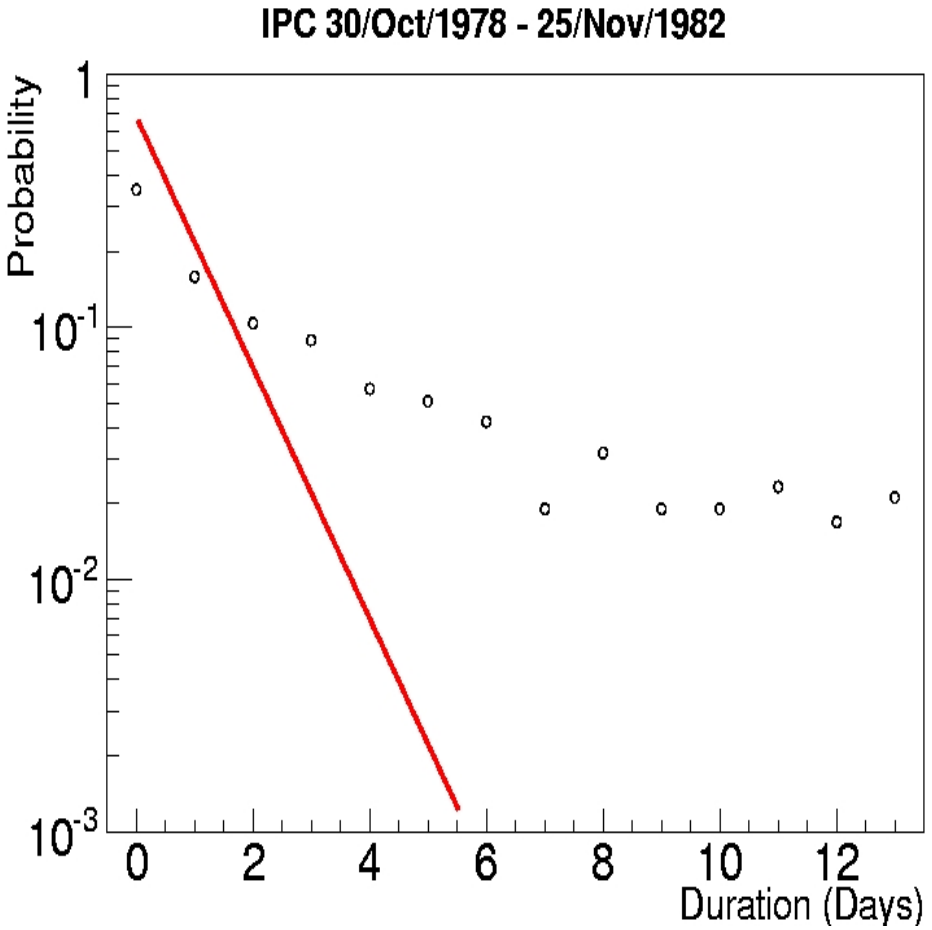


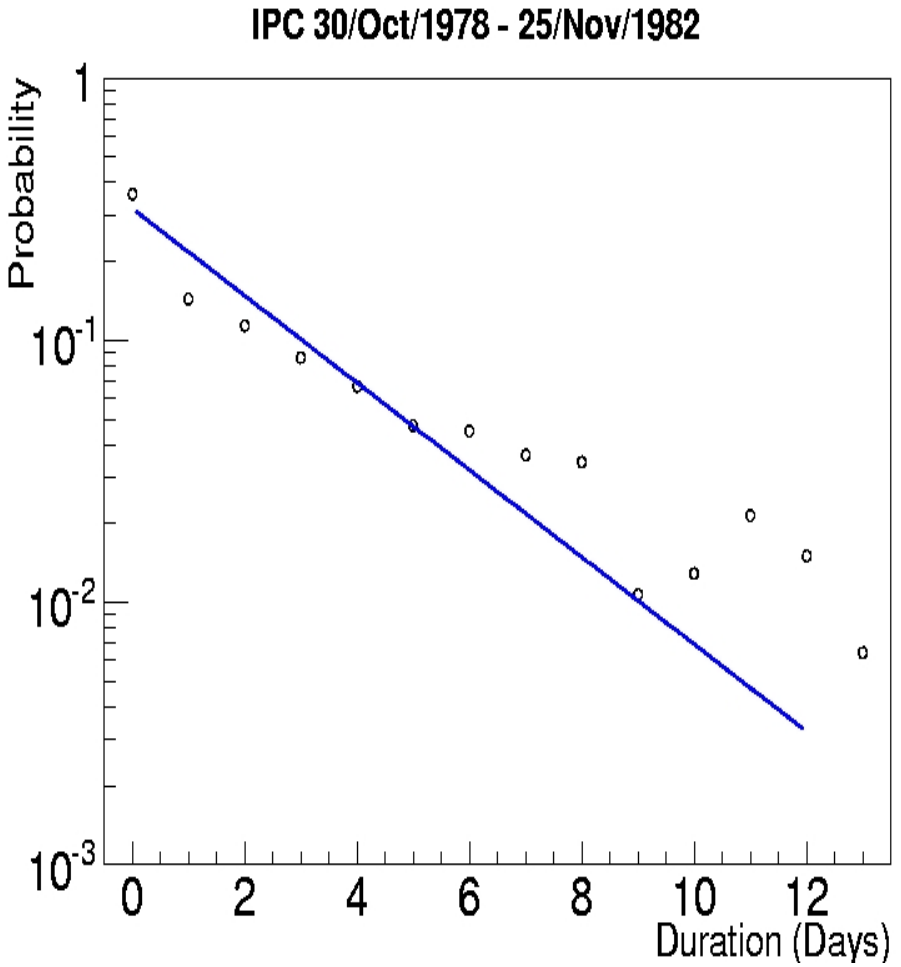


P = 0.511

P = 0.489

Distribution of trends duration: Mexican IPC





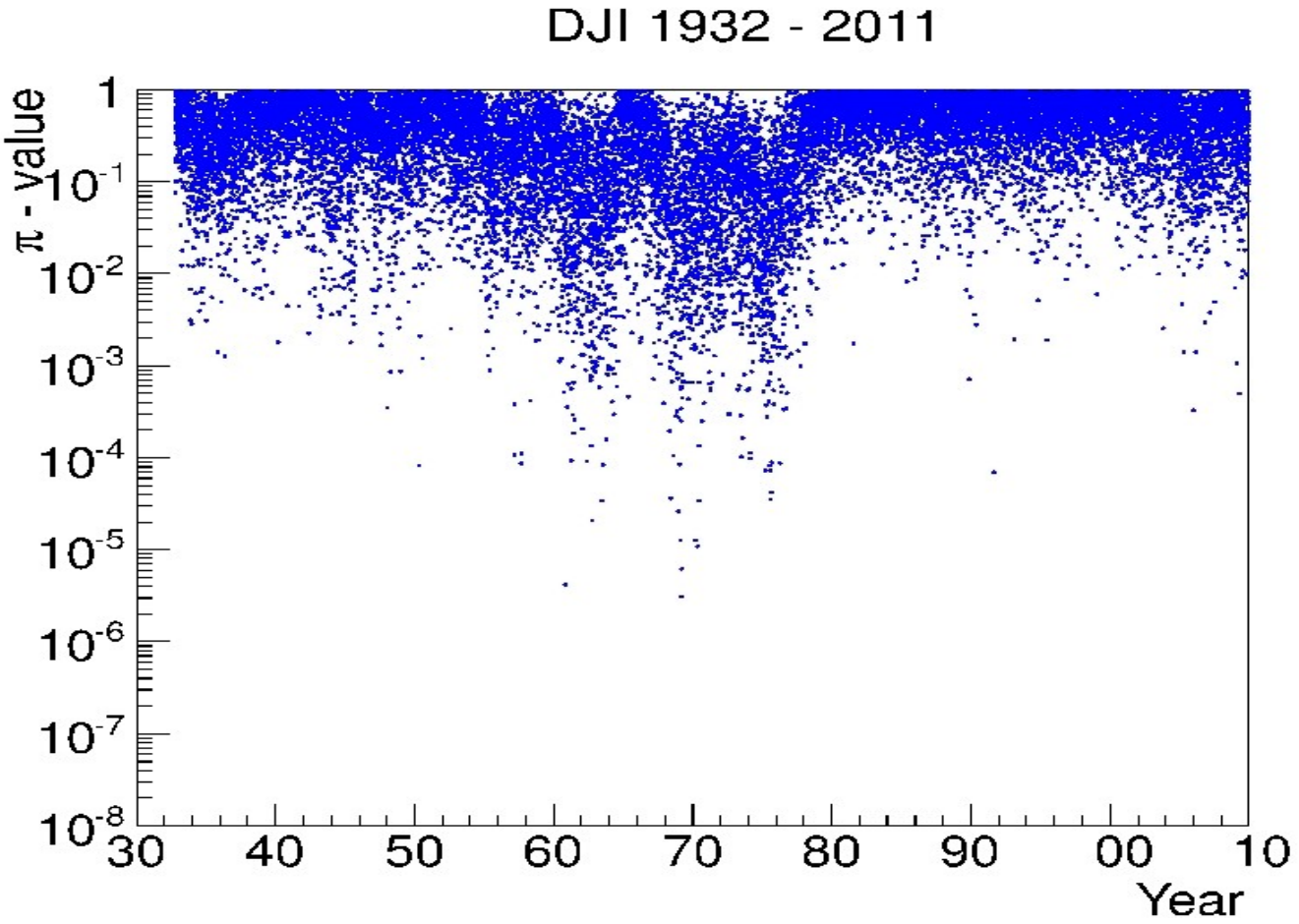
P = 0.318

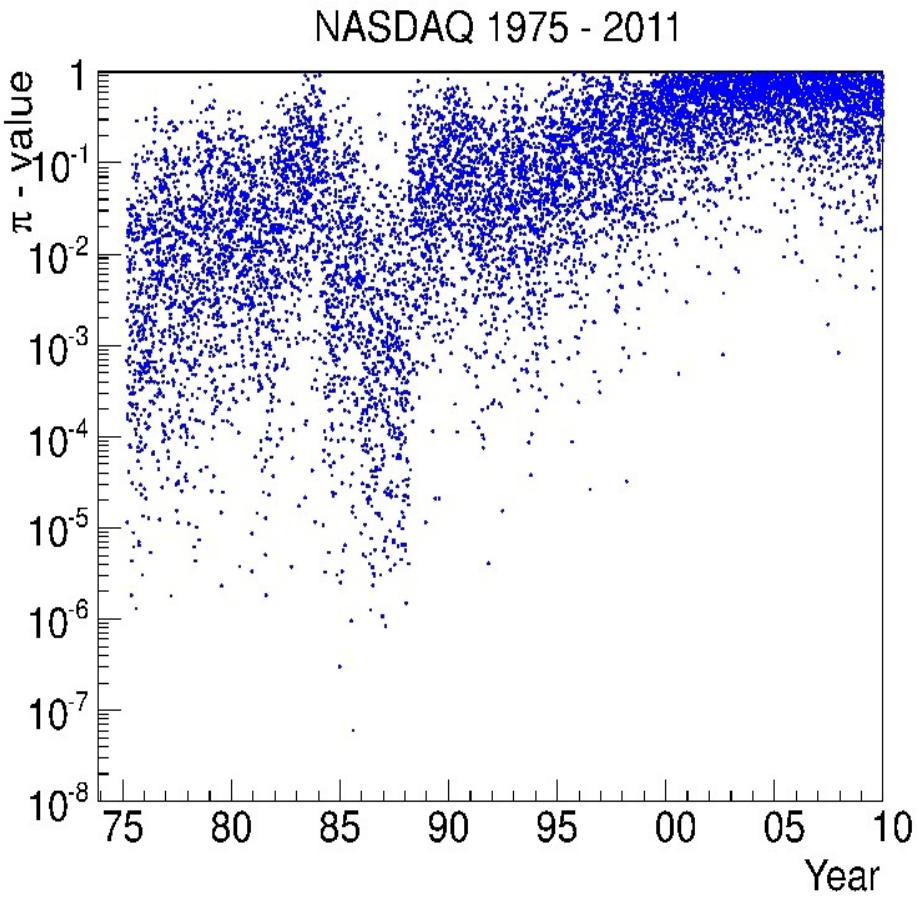
P = 0.682

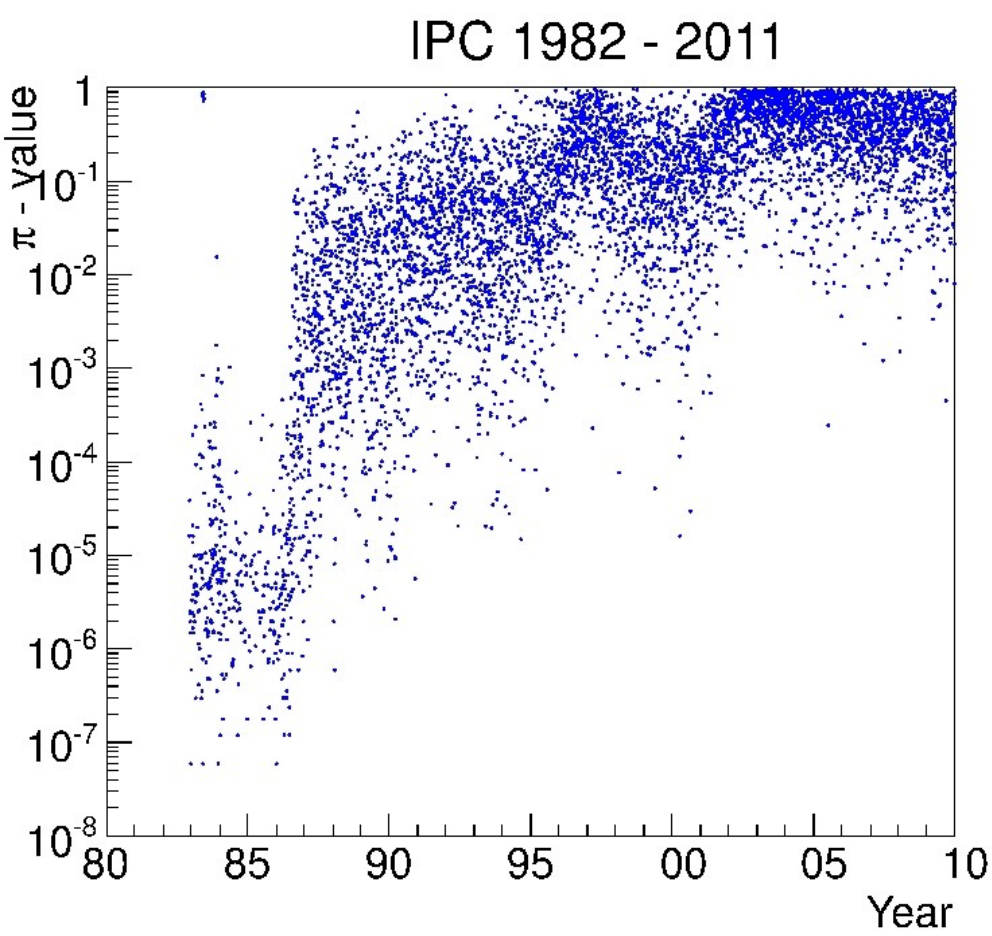
Bonus: Anderson-Darling study.

Instead A^2 p-values evolution is shown.

Remember: p-value of A^2 is the probability of obtain a value of A^2 at least as extreme as the observed, supposing a geometric distribution.







P-values of A^2 statistic show that DJIA the greatest deviation from a geometric Distribution ocured between 1960-1980

For Nasdaq and IPC, it shows that both markets are becoming more efficient.

Conclusions: We are currently writting them!

Thank you very much!