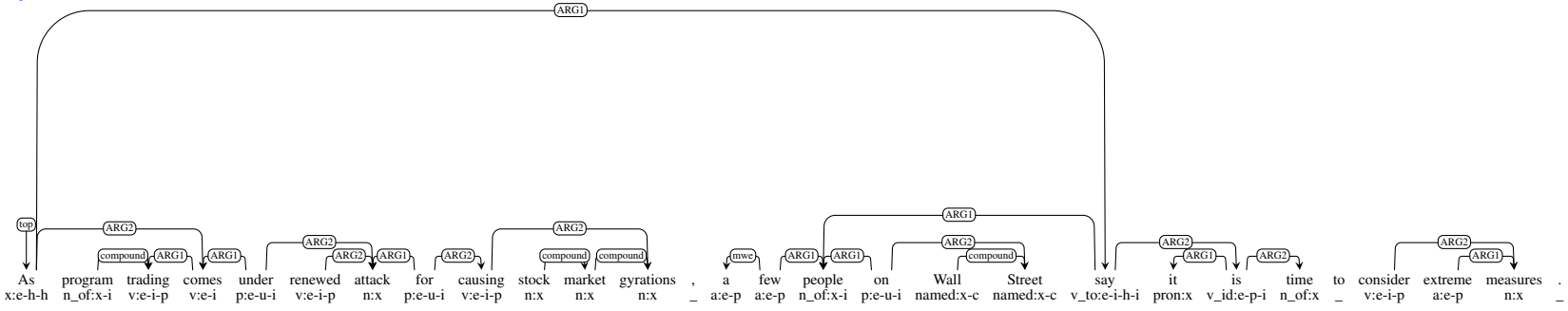
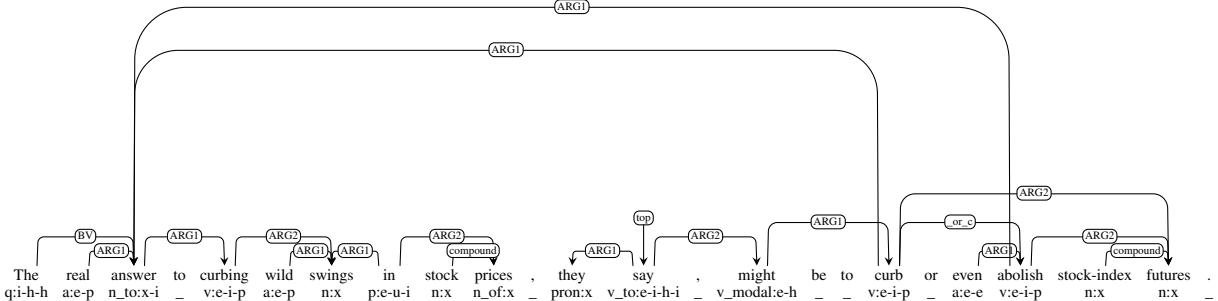


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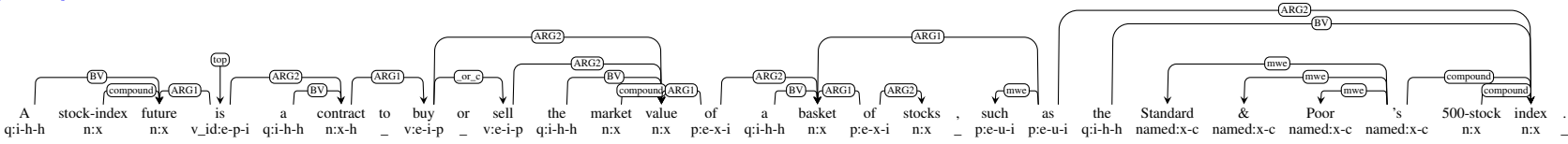
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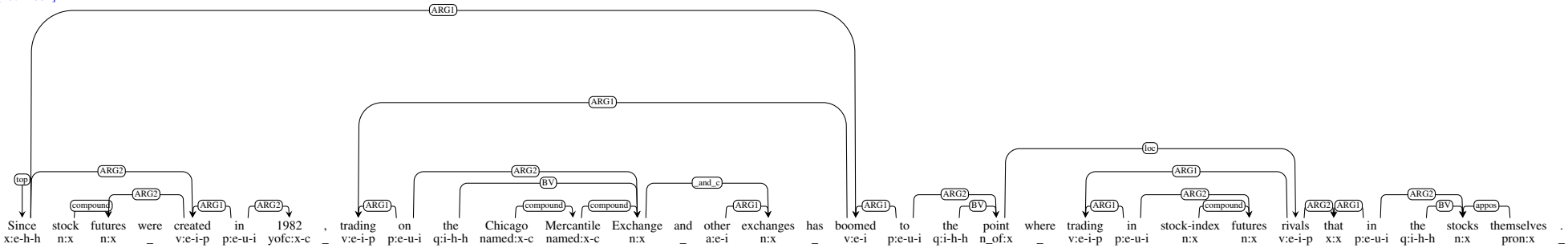
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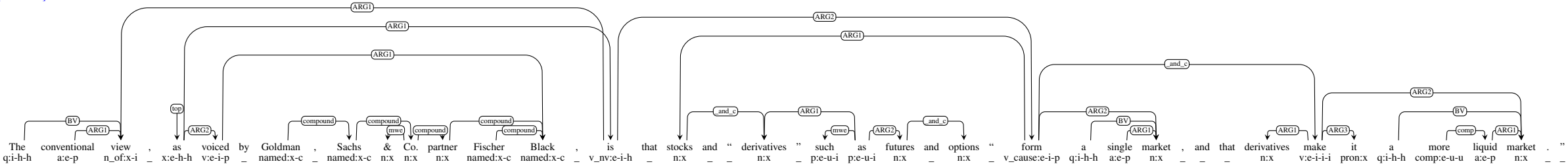
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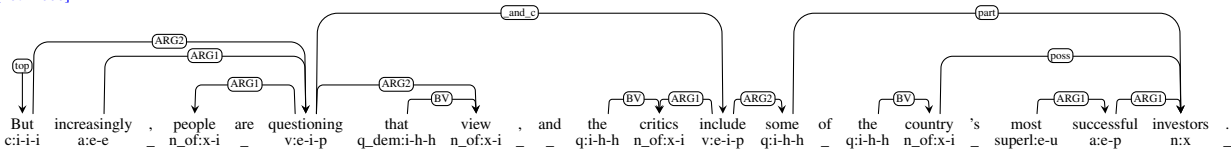
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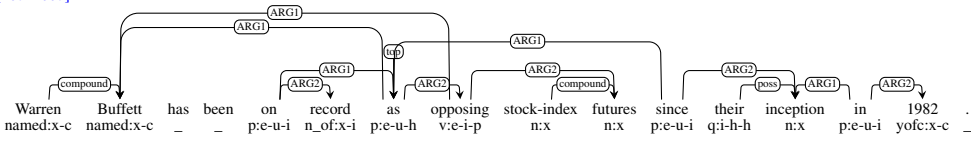
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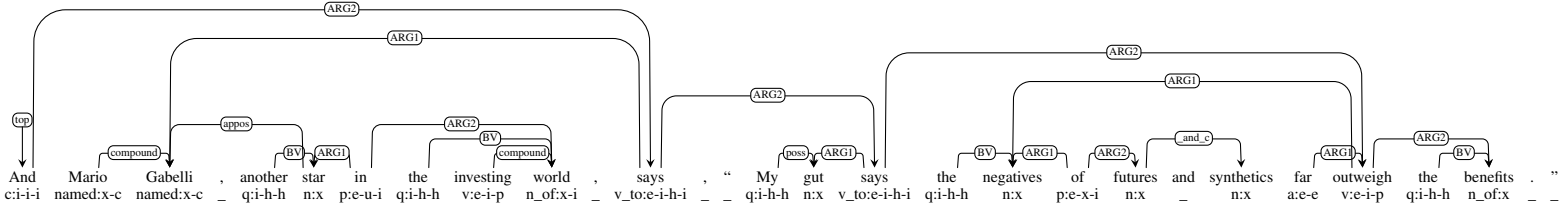
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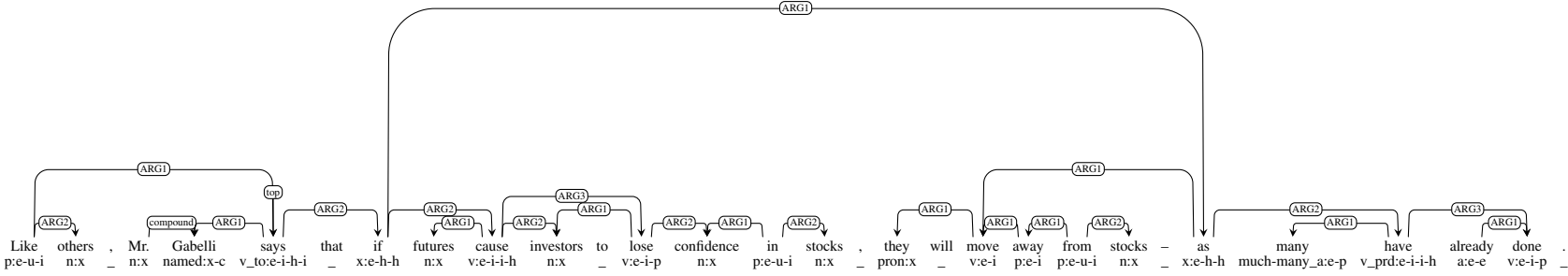
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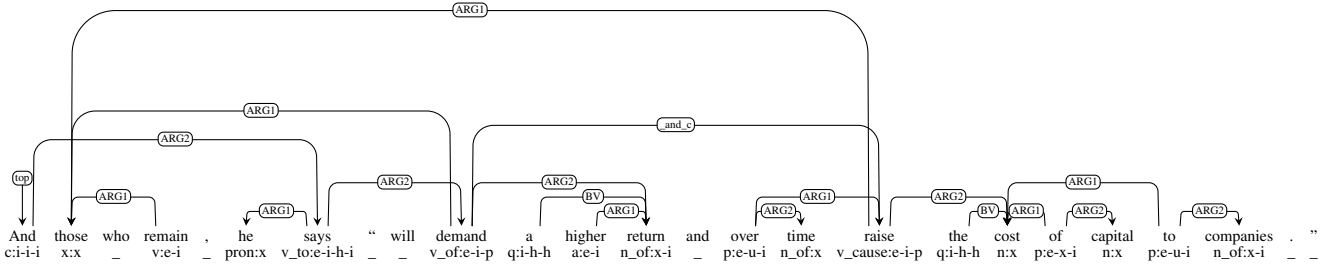
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[20742009]



[20742010]



[20742011]

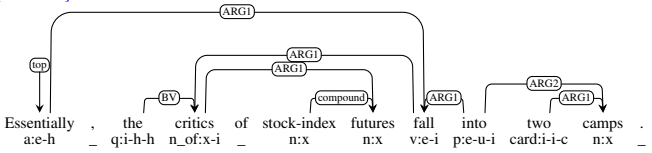


Figure 1: A sentence with its semantic network. The sentence is: "Before futures, New York investor Michael Harkins, you actually had to pay attention to whether the thing you were buying had any intrinsic value." The semantic network shows the relationships between the words in the sentence. The root node is ARG1, which branches into ARG12, ARG2, and ARG3. ARG12 branches into ARG122, ARG123, and ARG124. ARG122 branches into ARG1222, ARG1223, and ARG1224. ARG1223 branches into ARG12232, ARG12233, and ARG12234. ARG12234 branches into ARG122342, ARG122343, and ARG122344. ARG122344 branches into ARG1223442, ARG1223443, and ARG1223444. ARG1223444 branches into ARG12234442, ARG12234443, and ARG12234444. ARG12234444 branches into ARG122344442, ARG122344443, and ARG122344444. ARG122344444 branches into ARG1223444442, ARG1223444443, and ARG1223444444. ARG1223444444 branches into ARG12234444442, ARG12234444443, and ARG12234444444. 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Figure 10: A dependency parse tree for the sentence "When futures prices jump up or down, the New York Stock Exchange follows." The tree shows the hierarchical structure of the sentence, with nodes representing grammatical functions like *ARG1*, *ARG2*, *COMP*, and *BY*. The root node is *ARG1*, which branches into *ARG1* and *BY*. The *ARG1* branch further divides into *ARG1* and *ARG2*, which then lead to the words "When" and "futures prices jump up or down, the New York Stock Exchange follows." respectively. The *BY* branch leads to the words "New York Stock Exchange follows.".

[illegible][illegible]

Figure 1: A dependency parse tree for the sentence "Paul Lesutis, who manages more than 3 billion cards of investments at Provident Capital Management Inc., blames futures markets for leading the way". The tree shows the hierarchical structure of the sentence, with nodes representing grammatical functions like ARG1, ARG2, and compound. The sentence is split into two parts by a comma, with the second part being a relative clause. The tree is rooted at the top with the label "S".

Figure 10: A parse tree for the sentence "The fundamentals do not change in an hour, he says." The tree structure is as follows:

- ROOT (S) branches into (NP) and (VP).
- (NP) branches into (The) and (fundamentals).
- (VP) branches into (do) and (V).
- (V) branches into (not) and (change).
- (change) branches into (in) and (NP).
- (NP) branches into (an) and (hour).
- (hour) branches into (,).
- (, ) branches into (he) and (says).
- (he) branches into (pron).
- (says) branches into (v-tox-i-h-i).

[illegible][illegible]

The figure displays two parse trees for the same sentence. The top tree is a full constituent structure tree, while the bottom tree is a flat dependency parse tree.

**Top Tree (Constituent Structure):**

- Root: **S**
  - NP** (Noun Phrase): Although index arbitrage
    - compound** (compound modifier): index arbitrage
  - VP** (Verb Phrase): is said to add liquidity to markets
    - ARG1** (Argument 1): is
    - ARG2** (Argument 2): said
    - ARG3** (Argument 3): to
    - ARG4** (Argument 4): add
    - ARG5** (Argument 5): liquidity
    - ARG6** (Argument 6): to
    - ARG7** (Argument 7): markets
- NP** (Noun Phrase): John Bachmann, managing partner of Edward D. Jones
  - compound** (compound modifier): John Bachmann, managing partner
  - ARG1** (Argument 1): of
  - ARG2** (Argument 2): Edward
  - ARG3** (Argument 3): D.
  - ARG4** (Argument 4): Jones
- VP** (Verb Phrase): says
  - ARG1** (Argument 1): too
  - ARG2** (Argument 2): much
  - ARG3** (Argument 3): compex- u-u
  - ARG4** (Argument 4): much-many\_ae-p
  - ARG5** (Argument 5): liquidity
  - ARG6** (Argument 6): is
  - ARG7** (Argument 7): n't
  - ARG8** (Argument 8): a
  - ARG9** (Argument 9): qj-i-h

**Bottom Tree (Dependency Parse):**

- Root: **S**
  - NP** (Noun Phrase): John Bachmann, managing partner of Edward D. Jones
    - compound** (compound modifier): John Bachmann, managing partner
    - ARG1** (Argument 1): of
    - ARG2** (Argument 2): Edward
    - ARG3** (Argument 3): D.
    - ARG4** (Argument 4): Jones
  - VP** (Verb Phrase): says
    - ARG1** (Argument 1): too
    - ARG2** (Argument 2): much
    - ARG3** (Argument 3): compex- u-u
    - ARG4** (Argument 4): much-many\_ae-p
    - ARG5** (Argument 5): liquidity
    - ARG6** (Argument 6): is
    - ARG7** (Argument 7): n't
    - ARG8** (Argument 8): a
    - ARG9** (Argument 9): qj-i-h





The diagram illustrates a dependency parse tree for the sentence: "Margin requirements for speculators on the Chicago Mercantile Exchange are currently 7% of the...". The tree structure is as follows:

- Root Node:** ARG1 (spanning the entire sentence).
- Level 1 Nodes:**
  - compound** (spanning "Margin requirements"):
    - ARG1** (spanning "Margin requirements")
  - ARG2** (spanning "for speculators"):
    - ARG1** (spanning "for speculators")
  - on** (spanning "on")
  - the** (spanning "the")
  - Chicago** (spanning "Chicago")
  - named** (spanning "named")
  - compound** (spanning "Mercantile Exchange"):
    - compound** (spanning "Mercantile Exchange")
  - are** (spanning "are")
  - currently** (spanning "currently")
  - ARG2** (spanning "7% of the..."):
    - ARG1** (spanning "7% of the...")
- Level 2 Nodes:**
  - ARG1** (spanning "Margin requirements")
  - ARG1** (spanning "for speculators")
  - ARG1** (spanning "7% of the...")

Arrows indicate the flow of dependencies between the words and their grammatical roles. For example, the word "are" is the head of the main clause, and "currently" is a modifier of "are". The word "7%" is the head of the relative clause, and "of the..." is a modifier of "7%".

The diagram illustrates the proposed framework for dependency parsing. It shows two sentences with their corresponding dependency arcs and semantic roles. The first sentence is "For 10 million card-i-c you can move 5 million card-i-c of stocks", with roles like ARG1, ARG2, and ARG3. The second sentence is "a specialist on the Big Board grapes", with roles like BV, ARG1, and NP. The diagram shows how these roles are mapped to a shared set of dependency arcs.

[illegible]

By contrast, an investor in stocks must put up 50% of cash. p-e-u n:x \_ an investor in stocks must put up 50 % of cash . p-e-u n:x \_

[illegible]

Figure 10: A semantic network for the sentence "It took away the need to know the bad third-quarter report of IBM for example, Mr. Keger says." The network shows the hierarchical structure of the sentence, with nodes representing semantic roles (ARG1, ARG2, BV, etc.) and their corresponding words or phrases. The network is a directed graph where nodes are labeled with semantic roles and words, and edges represent the relationships between them. The sentence is: "It took away the need to know the bad third-quarter report of IBM for example, Mr. Keger says." The network shows the hierarchical structure of the sentence, with nodes representing semantic roles (ARG1, ARG2, BV, etc.) and their corresponding words or phrases. The network is a directed graph where nodes are labeled with semantic roles and words, and edges represent the relationships between them.

The diagram illustrates the syntactic structure of the sentence "The S&P futures are merely a "cheaper and quicker" way to get access to all 500 stocks he pronounces." The structure is a complex noun phrase (NP) acting as the subject of the main clause, which is not fully shown. The NP is headed by the determiner "The" and the noun "S&P futures". The head noun "futures" is modified by the adjective "are" (via the copula "are"). The noun phrase "merely a "cheaper and quicker" way to get access to all 500 stocks he pronounces" is the complement of the copula. This complement is a complex NP headed by the adjective "merely". The head "merely" is modified by the adjective "a". The noun phrase "cheaper and quicker" is the complement of "a". The head "cheaper" is modified by the adjective "and". The noun phrase "way to get access to all 500 stocks he pronounces" is the complement of "and". The head "way" is modified by the adjective "to". The noun phrase "to get access to all 500 stocks he pronounces" is the complement of "to". The head "to" is modified by the adjective "get". The noun phrase "get access to all 500 stocks he pronounces" is the complement of "get". The head "get" is modified by the adjective "access". The noun phrase "access to all 500 stocks he pronounces" is the complement of "access". The head "access" is modified by the adjective "to". The noun phrase "to all 500 stocks he pronounces" is the complement of "to". The head "to" is modified by the adjective "all". The noun phrase "all 500 stocks he pronounces" is the complement of "all". The head "all" is modified by the adjective "500". The noun phrase "500 stocks he pronounces" is the complement of "500". The head "500" is modified by the adjective "stocks". The noun phrase "stocks he pronounces" is the complement of "stocks". The head "stocks" is modified by the adjective "he". The noun phrase "he pronounces" is the complement of "he". The head "he" is modified by the adjective "pronounces".

The diagram illustrates the syntactic tree structures for two sentences from the Penn Treebank dataset. The first sentence is "The q-i-h-named-x-c Big Board named-x-c yesterday time\_nx began trading v-e-i-p in its own basket trade-v-p vehicle n\_x representing the q-i-h-n S&P 500 stock i-c stocks n\_x". The second sentence is "The q-i-h-named-x-c Big Board named-x-c yesterday time\_nx began trading v-e-i-p in its own basket trade-v-p vehicle n\_x representing the q-i-h-n S&P 500 stock i-c stocks n\_x". The trees show hierarchical groupings of words into phrases like "Big Board", "yesterday time", "begin trading", "in its own basket", "trade vehicle", "representing the", "S&P 500 stock", and "stocks".

But owning index futures is n't the same as owning the underlying stocks .  
ci-i-i v-i-e-p n:x n:x v\_idc-p-i v\_idc-p-i the a\_as:e-i v-i-e-p q'i-h-h v-e-i-i n:x

Stockholders  
n\_x

as  
p\_e-u-i

a group  
q\_i-h-h  
n\_o-f\_x

can  
v\_m-a-d-e-h  
v\_e-i-p

win  
w-i-n

because  
x\_e-h-h

they  
t-h-e-y

own  
o-w-n

a share  
q\_i-h-h  
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o-f

corporate  
c-o-r-p-o-r-a-t-e

earnings  
e-a-r-n-i-n-g-s

which  
w-h-i-c-h

grow  
g-r-o-w

and  
a-n-d

boost  
b-o-o-s-t

stock  
s-t-o-c-k

prices  
p-r-i-c-e-s

and  
a-n-d

the  
t-h-e

company  
c-o-m-p-a-n-y

[illegible]

Figure 1: A parse tree for the sentence “You do not own anything, says Stephen Boesel, a money manager for T. Rowe Price in Baltimore.” The tree is annotated with the names of the nodes and the words they dominate. The root node is *S*, which dominates the entire sentence. The sentence is divided into two main clauses by a comma. The first clause is a negated statement, and the second clause is a statement of ownership. The tree structure shows the hierarchical organization of the sentence, with nodes like *ARG1*, *ARG2*, *COMP*, and *OP* representing different grammatical functions. The words are grouped into phrases, such as “You do not own anything” and “Stephen Boesel, a money manager for T. Rowe Price in Baltimore”.

“ You 're making a pure bet on the market .  
 \_ pron:x \_ v:e-i-p-u qi:h-h a:e-p n:x p:e-u-i qi:h-h n:x