Bayesian Network Decomposition in Autotraders

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Model Description

Question to be modeled (core node): Will Greece remain a member of the European Union by June 2nd 2012?

Decision nodes:

1. Will Greece be ejected from the EU by June 2nd 2012? Outcome: Y/N
2. Will Greece withdraw from the EU by June 2nd 2012? Outcome: Y/N

Parent (causal) nodes:

1.1. Will Germany vote to keep Greece in the EU by June 2nd 2012? Outcome: Y/N – if so, when would it take effect?
1.2. Will the other EU members vote to keep Greece in the EU by June 2nd 2012? Outcome: Y/N
2.1. Will the Greek elections winner withdraw Greece from the EU by July 1st 2012? Outcome:

- Panhellenic Socialist Movement (PASOK)
- New Democracy (ND)
- Communist Party of Greece (KKE)
- Popular Orthodox Rally (LAOS)
- Coalition of the Radical Left (SYRIZA)
- Democratic Left (DIMAR)

Evidential nodes (blue):

- 2.1.1. The current state of the market (t1)
- 2.1.2. The previous state of the market (t0)
- 2.1.3. Opinion polls or other markets

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Modeling method: Noisy-OR
Links weight: normalized

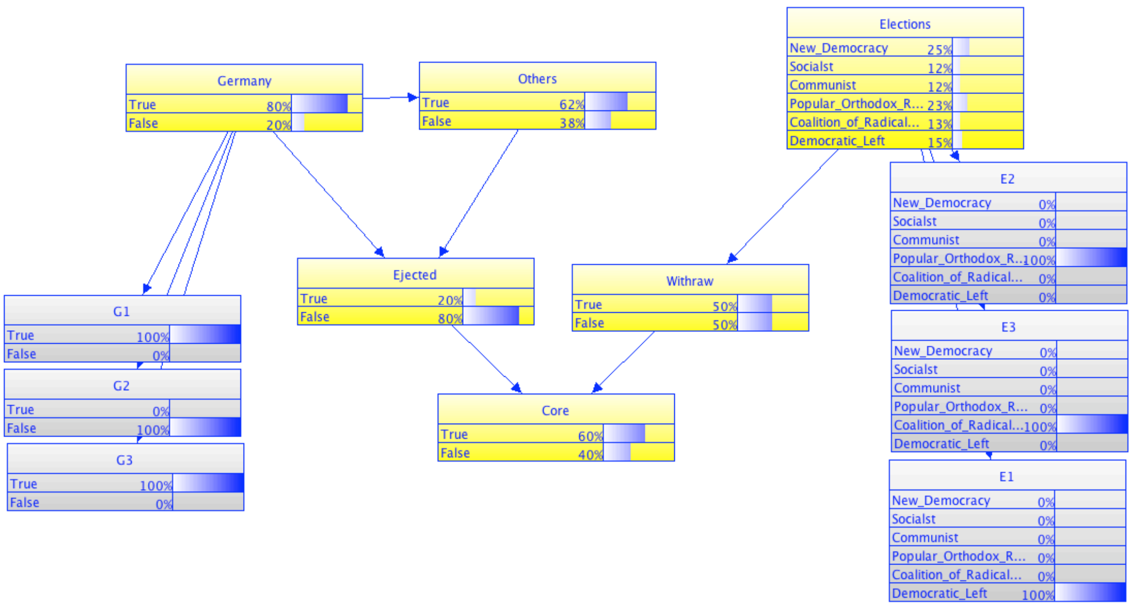

Fig. 1. The BN decomposition in UnBBayes

Model implementation with autotraders:

The probability of the core node is given only by soft observations. The core node is the final outcome of the model, that we need to assess based on the daily updating of evidential nodes (blue).

The evidential nodes are the inputs in the model. The core is the output. Evidential nodes G1 and E1 represent the status of the prediction market for nodes “Germany” and “Elections” respectively, at time t-1. The evidential nodes G2 and E2 represent the status of the prediction market at time t (updated in the present). The evidential nodes G3 and E3 represent estimates/information that comes externally from other sources and which are given to the programmers by the researcher (such as opinion polls or other prediction markets).

The probabilities in the evidential nodes are updated by introducing the likelihood values. For example, if we introduce a likelihood of 60% true (40% false) in the G1 node and propagate, we observe the network as in Fig.2.

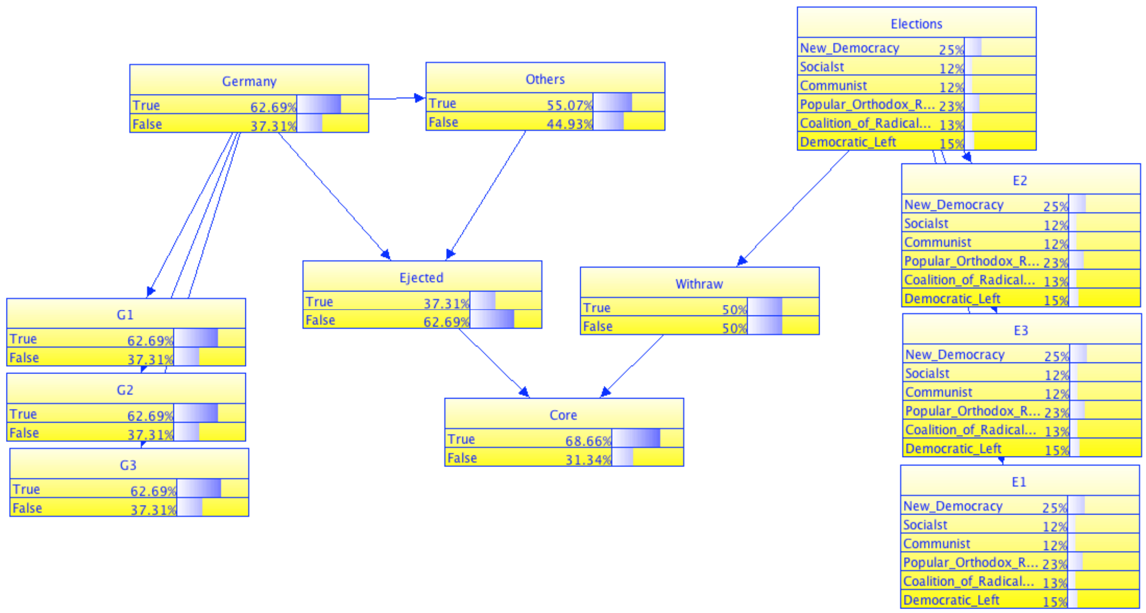

Fig. 2. The likelihood values introduced in node G1 are propagated through the network

Similarly, if we introduce the likelihood values of 60% for the "New Democracy", 10% for the following 4 and 0% for the last one in the E1 node and propagate through the network, the core probabilities get updated.

The likelihood values for G1, G2, E1 and E2 are given by the estimates from the dagger.org prediction market in 2 consecutive days. The likelihood values for G3 and E3 are given to the programmer by the researcher from external sources.

For the core node, the researcher uses the likelihood observation (which comes also as an estimate from the market) in order compare the autotrader behavior with the market behavior.

Question still pending: the use of Jeffrey's Rule in UnBBayes

Model Discussion (argument for model setup):

In this model we are testing the following 2 theories:
1. Greece will exit the EU in 2012 due to internal and external social pressures;
2. Greece will stay in EU in 2012 due to economic strategic pressures from Germany.

Greece can be only: 1. Ejected; 2. Withdraw. The main question to answer for the model is who decides what? Germany is influential, but who else from the EU can decide the outcome? Do the bailouts have any influence in this decision?

The variables we have identified as important for the outcome of the model are: Contain crisis and the costs of exit (theory 2); Social pressures and the Greek elections (theory 1).

Greece has defaulted on all its loans, yet it also received a huge cut on its private debt. If Greece remains in the EU, then all the EU countries will indirectly suffer from the Greek crisis, in the sense that they will bear some of the financial burden. On another hand, there are many economic and strategic issues at hand that are in favor of keeping Greece in the EU, such as commercial and maritime geostrategic influences. On another hand, a big part of the financial burden has been already taken by Greece and the bailouts would be without payoff on the long run. The debt swap deal seems to be a solution on the short run.

Greece is also holding new elections. The Greek population and the German population are frustrated and this may influence heavily the elections outcome and the desire to leave the EU. If Greece leaves the EU, it will return to its currency gradually (it cannot do it suddenly), which means that for a while it will still use the euro. But this will lead to very high inflation and possibly more protests within the country. This will also mean that all the commercial ad international trade will suffer in the sense that Greece is unlikely to sustain exports.

Stratfor sees the European system as fatally flawed and predicts more crisis for Europe. This can accentuate the exit of Greece from the EU. On another hand, the Economist Intelligence Unit assesses that keeping Greece in will buy the euro zone some more time to prevent further contagion to countries such as Portugal, Spain and Italy. But it will do nothing to return the Greek economy to sustainable growth. And it will do nothing to tackle the broader causes of the crisis. Euro area leaders, driven by Germany, will continue to pretend that the sovereign-debt crisis is solely down to problems with individual states' public finances—and indeed that Greece is the only country in crisis.

If euro zone leaders continue to disregard other root causes of the crisis (such as wide balance-of-payments imbalances, with current-account surpluses in northern Europe being mirrored by deficits in southern Europe) and continue to downplay the self-defeating logic of further fiscal austerity and weak growth prospects, the sovereign debt crisis in Greece, and elsewhere, is here to stay.

There are also multiple social pressures from outside Greece: taxes are too high to keep bailing out Greece. The population in Germany is unhappy with the Greek bailouts, but how much influence do they have on the strategic economic decision to keep Greece in? On another hand, the upcoming Greek elections will show the preference of the Greeks for opt-in or opt-out.

There have also been circulated alternative legal propositions to keep Greece in, such as changes in the Maastricht Treaty to add exit options or some other legal provisions for Greece to stay in EU under certain special provisions, such as those given to Sweden or UK.

Germany's strategy is given by both the bailouts and the alternative legal propositions. Germany wants to contain crisis in Greece and from the economic and political point of view it is more likely to keep Greece in EU. Bailouts are a key economic influence tactic and the sunk cost is not that strong, since the ECB can afford the bailouts (Greece GDP deficit represents only 2% in the overall EU economy).