HiddenLevers Model Overview

HiddenLevers' core model uses a multilevel approach to find meaningful relationships between economic scenarios, economic indicators (levers), and investment assets. The model currently supports a wide range of asset classes including stocks, ETFs, ADRs, mutual funds, currencies, fixed income instruments, and options. A high level overview of HiddenLevers' overall modeling approach is provided below; please see the additional documents referenced in the Appendix for further details on specific portions of the model.

The HiddenLevers model is currently composed of two levels: a regression model that calculates the relationships between every economic lever and every asset, and an intelligent filtering process that separates out correlation from causation within this large universe of regression data. The two stages of the HiddenLevers model are described in detail below.

The diagram below depicts the multi-level modeling approach used by HiddenLevers:

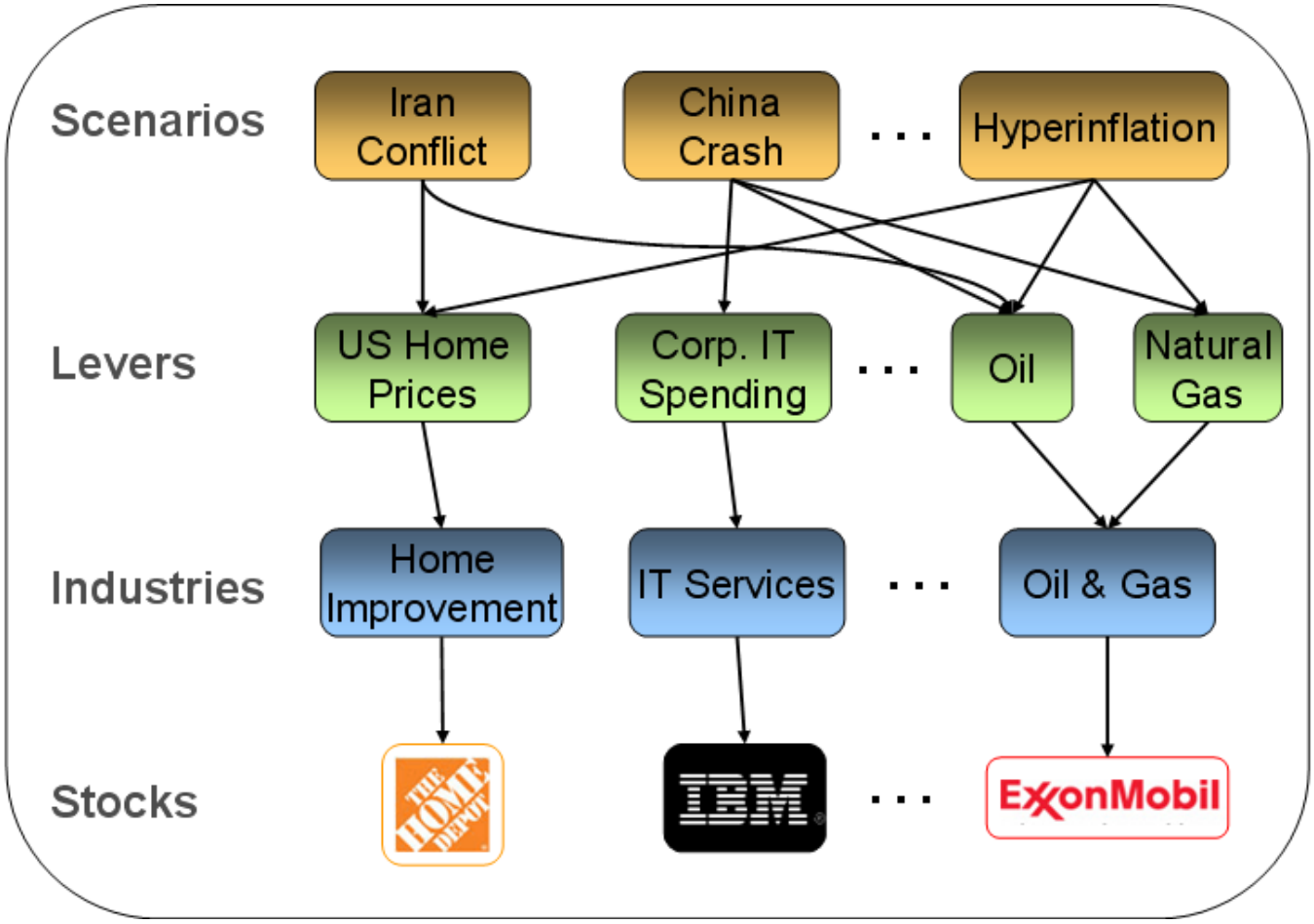


Figure 1: HiddenLevers Multi-Level Model

1. Key Elements of the Model:

The major components of HiddenLevers model are defined here:

- **Scenarios:** A scenario is a representation of a major macro-economic or geopolitical event which has the potential to impact investment returns. HiddenLevers models scenarios as a set of up-or-down movements in any of the economic indicators (levers) in the system. For instance, a high inflation scenario might consist of upward movements in CPI, oil prices and other commodities prices, and an increase in interest rates (in addition to movements in other indicators). HiddenLevers uses multiple methodologies in creating forward-looking scenarios, which are covered in detail in the *Scenario Creation* white paper listed in the Appendix. HiddenLevers also covers historical scenarios, which capture the historical movements of economic indicators during a specified historical economic event.

- **Levers:** HiddenLevers tracks over 130 different levers (economic indicators), including major macro statistics like GDP growth and CPI, market data like commodities and currency prices, and industry-specific levers like shipping rates and housing starts. HiddenLevers stores historical data for all levers, with up to 100 years of data available in some cases. New levers continue to be added over time, increasing HiddenLevers' modeling capability.

- **Industries:** HiddenLevers has created a proprietary industry list, adding new industries where needed to capture the intricacies of the modern economy. Existing industry lists like the S&P GICS do not have categories for solar energy, wind energy, or other new industries. Existing industry lists also lack the precision needed for HiddenLevers' economic modeling. HiddenLevers has added industries like Fast Food and Transaction Processing to capture these gaps, and has mapped all US stocks, ETFs, and ADRs to the list. HiddenLevers maps stocks, ETFs, and ADRs to its proprietary industry list, mapping one stock to multiple industries when necessary to correctly model its business. Apple (AAPL), for instance, is mapped to both the Personal Computers and Wireless Devices industries, since it has a significant presence in both industries. ETFs and other funds are mapped to special industries which categorize funds by sector or general fund type.

- **Assets (Stocks etc):** HiddenLevers' models can be used with a wide range of asset classes, including stocks, ETFs, mutual funds, closed-end funds, options, and bonds. End-of-day pricing is used for all modeling and analytics, since macro-economic events tend to unfold over the course of weeks, months, and years (though they can have short-term impacts). HiddenLevers maintains two decades of historical pricing data for its assets where possible.

2. How Model Elements Interact:

As depicted in Figure 1, the scenarios, levers, industries, and assets in the HiddenLevers model interact to provide projections of asset returns in a scenario:

Scenario → Levers → Assets (Stocks etc) → Portfolio Return

A scenario pushes levers up or down, which in turn push assets up or down, which in turn impact a portfolio's potential return in the scenario. As described in section 1, a scenario is modeled as a set of movements in the levers. But how is the relationship between these lever movements and asset returns determined?

This relationship is determined using regression analysis to examine the impact of a lever on a particular asset's returns. For instance, regression analysis is used to determine the relationship between oil and an oil company stock like Exxon-Mobil (XOM). The HiddenLevers model analyzes every possible asset – lever relationship, and runs millions of regressions on a nightly basis. In order to weed out spurious correlations in this mass of data, the industries depicted in Figure 1 are used as part of a guided filtering process. This process helps the model to eliminate statistical relationships which do not show sufficient evidence of causation. The HiddenLevers regression analytics model is described in more detail in the *Statistical Analysis* white paper listed in the Appendix below.

3. Applying the Model to a Portfolio:

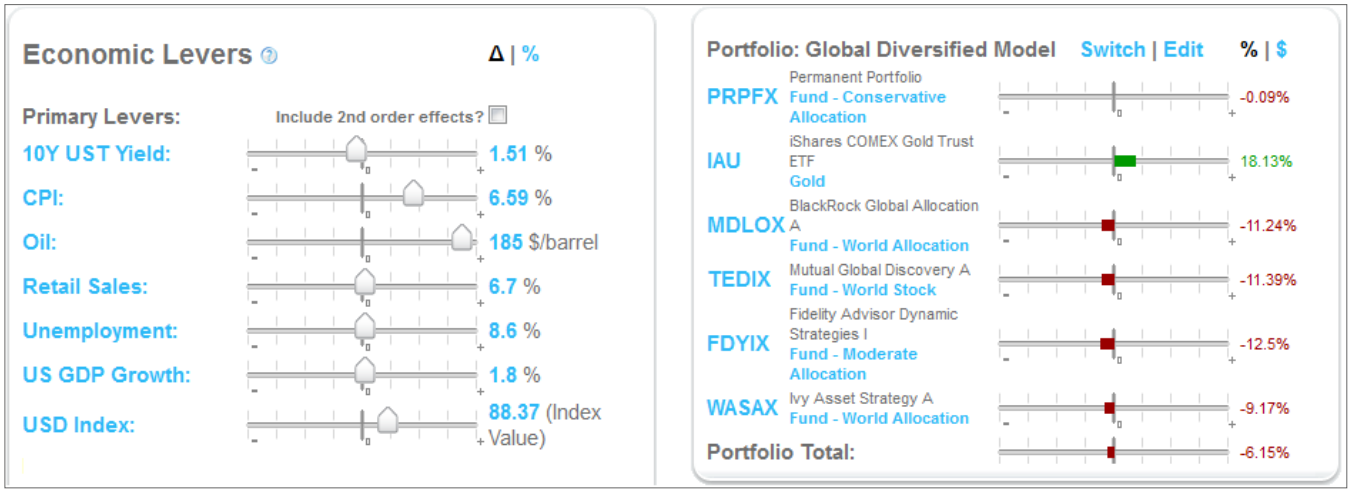
How is the HiddenLevers model actually applied to a portfolio in HiddenLevers Scenario Modeling?

Once a user chooses a portfolio and scenario for analysis, the model runs each asset in the portfolio through the scenario as described above. The model then totals the impact across the portfolio in order to determine total portfolio return in the scenario. The model also adds in returns based on dividend or interest when calculating final portfolio return (this is dependent on the timeframe defined for the scenario). HiddenLevers users can modify how levers move in a scenario in order to change the model assumptions – making such a change causes the model to recalculate based on the new user-entered assumptions.

Since multiple levers may simultaneously impact a position in a particular scenario, the model controls for potential correlation between levers to avoid double-counting of impacts. For instance, the price of copper and the price of other base metals like aluminum may be highly correlated. If a major miner like BHP is correlated to both copper and aluminum, and both levers move in a scenario, the scenario model uses the cross-correlation between copper and aluminum to adjust the total impact of these levers on BHP.

4. Portfolio Example:

Figure 2 below shows the impact of a sample scenario on a simple portfolio of stocks and ETFs:



The lever movements on the left-hand side of the screen are translated by the model into impacts on each position in the portfolio, based on the statistically-derived impact relationships between levers and assets. The total portfolio impact is calculated by simply aggregating the position-specific impacts.

As shown above, users can easily manipulate scenario assumptions on how different levers move in order to test different potential outcomes. Using the model described in sections 1-3, HiddenLevers recalculates the total portfolio return on the fly whenever assumptions are changed.

Appendix

The following white papers discuss HiddenLevers regression modeling and scenario modeling in greater detail:

HiddenLevers Statistical Analysis White Paper

HiddenLevers Scenario Modeling White Paper