Game Theory and Macro Investing
The Playbook
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Financial advisors today have the most modern of tools available—smartphones that double as pocket-size computers, technology solutions that render paper nearly obsolete and software capable of crunching numbers at lightning speed.

The modern-day advisor is up to date except in one crucial area. Many advisors have yet to update their thinking about the implications of investing in today’s geopolitical environment. The post-Cold War period continues to color advisor expectations today. But, the instability of the current environment has more in common with the first half of the 1900s than with the second half. There is a new, evolving world order affecting asset prices.

Successful pursuit of investment opportunities today, we believe, requires taking a fresh look. By providing a framework for better assessing what’s happening around the world, game theory offers a way for you to “get your head in the game.”

**Rock, Paper, Scissors**

*If you’ve played rock, paper, scissors, you understand game theory. Game theory is a form of analysis of competitive situations where the outcome of a participant’s choice of action depends upon the action of other participants.*

We’ve seen game theory at work in some of this country’s most anxious moments. In the Bay of Pigs missile crisis, for example, President John F. Kennedy made a successful calculation that ended with a peaceful resolution of a confrontation with the Soviet Union and Cuba.

But, the application of game theory to investing is less common. Without a proper introduction—a primer, if you will—game theory’s usefulness may not be intuitive. The purpose of this playbook is to provide background on game theory’s value and show you it in practice. With this context you may assess opportunities with a different lens that could inform how you build investment portfolios.
For more than 50 years from the start of the Cold War to the Berlin Wall’s collapse in 1989, there was a stability in the world that enabled long-term economic planning. Because the world’s two main players—the United States and the Soviet Union—both had nuclear missiles, use of the missiles by one country would have resulted in mutually assured destruction (MAD).

Just one mistake would have had a costly consequence, as both nations knew, and that in turn led to stability in non-communist countries.

But, after a lingering lull of post-Cold War stability, the world has evolved into the multiplayer game of today. Advisors and investors now look out across a geopolitically unstable horizon, spanning Iran and Israel, China and Japan, Ukraine and Russia, and the eurozone.

In contrast to years ago when the United States and the Soviet Union were the two dominant players bounded by MAD, the analysis required today is much more complex. There are more than two players and information is incomplete. The immediate consequences of miscalculation may be diminished, but the probability of miscalculation has mushroomed.

### The Return of Instability Further Complicates Investment Planning

<table>
<thead>
<tr>
<th>Pre-Cold War 1900–1950</th>
<th>Cold War ~1950–1980s</th>
<th>Post-Cold War 1990s–Present</th>
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<tbody>
<tr>
<td><strong>Multiple Players</strong></td>
<td><strong>Two Players: U.S. &amp; USSR</strong></td>
<td><strong>Multiple Players</strong></td>
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<tr>
<td>• Players evolve</td>
<td>• Mutually Assured Destruction (MAD)</td>
<td>• Players evolve</td>
</tr>
<tr>
<td>• Information is incomplete</td>
<td>• Mistakes are improbable, with huge cost</td>
<td>• Information is incomplete</td>
</tr>
<tr>
<td>• Mistakes are probable, less costly</td>
<td></td>
<td>• Mistakes are probable, less costly</td>
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**STABLE**

The binary game was well known and easy to evaluate. Appropriate fundamental analysis was rewarded over time. Stocks gained and more investors participated.

**UNSTABLE**

Market instability is driving some investors from the capital markets. Advisors are seeking to better manage risk by protecting against tail risk and understanding global risk exposures and macro themes.

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**Industries? Sectors? Yes, But...**

Geopolitics was considered extensively throughout the first and second world wars but its relevance for investors diminished during the bipolar Cold War period. Capital and financial market activities focused on capitalistic markets and there was little need for investors to involve themselves with the day-to-day intrigue of the two big players.

During those years it was believed (and it was true) that sector and industry influences trumped national influences.

The game has changed. Increased global integration and connectedness demonstrate the importance of geopolitical science in the pricing of assets and resources, even when the focus is within a single country.
Fundamental value inexorably pulls on price over longer-term horizons. In the interim, macro developments can compel price either away from or toward fundamental value. But, the global complexity of these macro developments typically exceeds what any human mind can process. This is where the application of analytic paradigms, such as game theory, are useful.

“The significance of the information is revealed by the theory within which it is analyzed,” says Brian Singer, CFA, and head of William Blair’s Dynamic Allocation Strategies team.

Superior analysis doesn’t derive from additional information. Rather, it is attributable in large measure to a better organization of the information and objective integration of diverse experience.1 Game theory provides boundaries for the complexity of the political and geopolitical macro developments to be analyzed.

“The focused, even confining, discipline of game theoretical models afford context within which we can fill knowledge gaps with independent, seasoned judgment in order to comprehend, embrace, and exploit inevitable uncertainty,” Singer says.

The Value of a Framework

Here’s how leading game theory academics describe the value of a framework:

“Facts do not ‘speak for themselves.’ They speak for or against competing theories. Facts divorced from theory or visions are mere isolated curiosities.”

Thomas Sowell2

“The mind is poorly ‘wired’ to deal effectively with inherent uncertainty (the natural fog surrounding complex, indeterminate intelligence issues) and induced uncertainty (the man-made fog fabricated by denial and deceptive operations)...He (Heuer) urges that greater attention be paid instead to more intensive exploitation of information already on hand.”

Introduction to Richard Heuer’s Psychology of Intelligence Analysis3

Brian Singer, CFA
Head of William Blair’s Dynamic Allocation Strategies Team

A long-time student of game theory, Singer is well known for his pioneering advances in the active management of multi-asset and currency portfolios. He leads the William Blair Macro Allocation Fund portfolio management team.
Game theory is a set of principles for scrutinizing the strategic interactions of multiple agents acting in their best interests and responding to their incentives through cooperation and conflict in anticipation of and in response to other players’ actions.

It is the sequential interactions such as the periodic U.S. debt ceiling negotiations, the continual eurozone crisis bargaining, and the perpetual conflict between Israel and Iran that are of interest.
Let’s consider the objectives that surfaced during the eurozone crisis that has evolved over the course of the last few years. As 2013 began, each of the 17 eurozone countries had individual objectives, some overlapping with other countries. After considering the four major countries’ cultural motivations, temporal interests, and economic incentives, and the European Central Bank’s (ECB) unique role, the objectives shown in the table at right were determined to be strategically motivational. These objectives will continue to evolve (see the updated table as of the end of May 2014) as the situation progresses and the players’ interests change.

### The 4 Major Countries’ Objectives During The Eurozone Crisis

#### Q1 2013

<table>
<thead>
<tr>
<th>Players</th>
<th>Primary Objectives</th>
<th>Secondary Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Preserve euro—for now</td>
<td>No call on German taxpayer</td>
</tr>
<tr>
<td>France</td>
<td>Peripheral stability</td>
<td>Eventual coalition leader of eurozone</td>
</tr>
<tr>
<td>Italy</td>
<td>Low interest rates (avoid bailout)</td>
<td>Cultural uniqueness (no Germanization)</td>
</tr>
<tr>
<td>Spain</td>
<td>Stay in the eurozone</td>
<td>Low interest rates</td>
</tr>
<tr>
<td>ECB</td>
<td>Preserve euro</td>
<td>Inflation rectitude</td>
</tr>
</tbody>
</table>

#### May 2014

<table>
<thead>
<tr>
<th>Players</th>
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<tr>
<td>Germany</td>
<td>No call on German taxpayer</td>
<td>Preserve euro—for now</td>
</tr>
<tr>
<td>France</td>
<td>Easy ECB/weak euro</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>Easy ECB policy, low yields</td>
<td>Increase leadership image in eurozone</td>
</tr>
<tr>
<td>Spain</td>
<td>Easy ECB policy, low yields</td>
<td></td>
</tr>
<tr>
<td>ECB</td>
<td>Preserve euro</td>
<td>Inflation stability</td>
</tr>
</tbody>
</table>

**Aligned Objectives**: Cooperation, accommodation, mutual reduction of risk

*Source: William Blair & Company*
Bargaining Powers

Multiplayer game analysis benefits from recognizing bargaining powers—tangible and intangible—that each player can use to exert control over other players by imparting potency to negotiating strategies. The William Blair Dynamic Allocation Strategies team assesses four bargaining power categories.

The 4 Bargaining Powers

<table>
<thead>
<tr>
<th>Bargaining Powers</th>
<th>What To Watch For</th>
<th>Examples</th>
<th>Instance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endowment power</td>
<td>Confidence, aggression</td>
<td>Political capital, vision, nuclear warheads</td>
<td>During the Cuban Missile Crisis, President Kennedy relinquished old nuclear missiles in Turkey as a quid pro quo for Khrushchev’s Cuban nuclear missiles withdrawal. If not for the endowment of missiles in Turkey, Kennedy would have lacked an important source of bargaining power. Today North Korea’s Kim Yong-un benefits from the possession of nuclear warheads.</td>
</tr>
<tr>
<td>Threat power</td>
<td>Bluffs, aggression, sacrifice</td>
<td>Lob some bombs, sacrifice collateral, bet “all in”</td>
<td>An “all-in” poker bet wagers one’s entire endowment to force other players to risk more than they can sustain and to “fold” (i.e., remove themselves from the hand).</td>
</tr>
<tr>
<td>Risk tolerance</td>
<td>Bluffs, disinterest, 11th hour resolution</td>
<td>Accept “no agreement,” incur collateral damage</td>
<td>President Kennedy estimated privately that the Cuban Missile Crisis increased the risk of broad nuclear confrontation between the Soviet Bloc and the U.S. to a 30% to 50% probability.</td>
</tr>
<tr>
<td>Coalition power</td>
<td>Solidarity, adaptability</td>
<td>“Merkozy” (Merkel &amp; Sarkozy), media</td>
<td>In World War II, the evolving Allied Powers coalition variously included France, the UK, the U.S., the Soviet Union, and others in the many fronts opposing the Axis Powers of Germany, Italy, and Japan.</td>
</tr>
</tbody>
</table>

Source: William Blair & Company
Eurozone Bargaining Powers

Here’s a look at the powers that the William Blair Dynamic Allocation Strategies team attributed to key eurozone players in the first quarter of 2013 and at the end of May 2014. Germany anchored a powerful coalition with France in the first quarter of 2012—referred to as “Merkozy”—that pushed for stringent austerity in the peripheral European countries.

The ECB, with its provision of liquidity to the financial system and influence over long-term interest rates in specific countries, has immense endowment power. Because the ECB’s endowment power is so strong when combined with its ability to wield that power as a threat to wayward countries, it is the superior power in the eurozone theater.

Given the high debt levels in Italy and the exposure of Europe to Italian debt and financial difficulties, Italy commanded tremendous threat power.

France shifted sides and became a powerful cornerstone of the “anti-austerity now” coalition that includes the peripheral countries.

The Greek elections in May and June of 2012 began a shift away from “Merkozy” austerity, and the coalition power of Germany dropped below that of many other players.

Italy’s coalition power strengthened significantly after Silvio Berlusconi’s opposition to Italy’s coalition government failed.

Populist anti-European Union/austerity vote in European Union elections weakened France’s overall bargaining power.

Incumbent leaders’ objectives coalesce around easy ECB policy and a weak euro. With lower than normal geopolitical risks in the eurozone, the crisis is receding.

Source: William Blair & Company

Source: William Blair & Company
Modes of Action

Commitments to punish, to reward, or to do nothing are difficult to make viable. Nonperformance must be eliminated as a possibility—opponents must know that a player will follow through on a commitment.

Obviating nonperformance requires “modes of action” that preclude a player’s own capacity to negotiate. In other words, the outcome must be solely dependent on the other player’s actions. Influencing the other player’s actions requires credible communication of how a player will act in the future.

The objectives of these modes of action are to convey credibility and to reinforce commitment by taking future actions out of the player’s control and persuasively communicating a lack of control.

Eight modes of action demonstrate commitment and enhance credibility, according to Dixit and Nalebuff in *Thinking Strategically*.

8 Modes of Action That Demonstrate Commitment

1. Reputation
   - Consistency counts
   - Actions must follow words in punishment and reward
   - Irrationality is consistent—“He’s crazy enough to do it!” (Example: Caligula)

2. Written contracts
   Written contract with independent, incentivized enforcement

3. Sever communication
   No communication means no negotiation

4. Burn bridges
   Succeed or perish (Cortés burned his ships before conquering Mexico)

5. Brinkmanship
   Risk that is not completely in one’s control—chance outcomes

6. Move in small steps
   Build trust through small-scale moves

7. Coalition teamwork
   Ultimate consensus (In ancient Rome, falling behind in attack was a capital offense executed on the spot by the observing soldier)

8. Mandated agents
   Leave the negotiations to another party with no interest in the outcome

Sources: Dixit and Nalebuff; William Blair & Company

Dr. Strangelove

Stanley Kubrick’s dark 1964 comedy *Dr. Strangelove* includes a great example of nonperformance preclusion. The Soviet “doomsday device” detects a nuclear attack and automatically and irrevocably launches a comprehensive nuclear counterattack. In this manner, the Americans can be certain that the Soviet threat of nuclear counterattack is immutable. Nonperformance is not an option. The humor in Kubrick’s *Dr. Strangelove* is Russia’s failure to inform the Americans of the doomsday device’s existence until after an American nuclear strike has been initiated.
**Brinkmanship Deliberately Creates Risk**

Of the eight modes of action, brinkmanship is the most critical. The essence of brinkmanship is the deliberate creation of risk.

Here’s how economist and game theory authority Thomas Schelling describes brinkmanship:

*The brink is not, in this view, the sharp edge of a cliff....The brink is a curved slope that one can stand on with some risk of slipping, the slope gets steeper and the risk of slipping greater as one moves toward the chasm...Neither the person standing there nor the onlookers can be quite sure just how great the risk is, or [sic] how much it increases when one takes a few more steps.*

Brinkmanship is thus the deliberate creation of a recognizable risk...a risk that one does not completely control. It is the tactic of deliberately letting the situation get somewhat out of hand, just because its being out of hand may be intolerable to the other party and force his accommodation. It means harassing and intimidating an adversary by exposing him to a shared risk, or deterring him by showing that if he makes a contrary move he may disturb us so that we slip over the brink whether we want to or not, carrying him with us.5

The idea of brinkmanship derives from the desire to create a deterrent before an event as opposed to a punishment after the fact.

Brinkmanship is frequently misunderstood. In fact, the U.S. government’s December 31, 2012, “fiscal cliff” reveals a failure to understand the slippery slope of the brink.

While the U.S. debt ceiling negotiations were underway, pundits globally commented on the dysfunctional nature of U.S. politics. The debt ceiling may be a flawed vestige of its 1917 creation to facilitate borrowing during World War I, but the negotiating tactics are not remotely dysfunctional. Bringing the U.S. government to the brink of closure was a powerful mode of action that should have been expected from rational players attempting to extract the best outcome for their respective parties. These actions, while frightening and ostensibly irrational, advanced the negotiation toward resolution.

Similarly, Alexis Tsipras of the Greek SYRIZA ticket advocated defaulting on his own country’s debt in the run-up to the May 2012 parliamentary election. Not only did this make a eurozone break-up a more tangible threat, Germany began to sense its own exposure. Germany would have had to deal with a revaluation of a re-emergent deutschemark in the year heading into German parliamentary elections, and it was dealing with the immediate implications of a daily flight of capital from the peripheral countries into German banks.

The threat moved the eurozone down the slippery slope toward the brink. But, by shifting negotiating power away from Germany Chancellor Angela Merkel and toward countries seeking delayed austerity, the threat moved Europe closer to an interim resolution.
Rocky, Bullwinkle & Game Theory

The adventures of Rocky & Bullwinkle, as played out in the Cold War-era (1959–1964) television cartoon and reprised in film in 2000, illustrate many of the principles of game theory.

In our fictitious example, we draw on the characters from the show, which features hapless American heroes, Rocky J. Squirrel and Bullwinkle J. Moose, and Russian-like spies, the fiendish but inept Boris Badenov and Natasha Fatale.

**Initial Conditions**
Seeking a $1 million ransom, Boris and Natasha have announced the presence of a cleverly hidden bomb in Rocky and Bullwinkle’s Frostbite Falls, Minnesota, home. In negotiating with Boris and Natasha, Rocky and Bullwinkle’s objective is to locate the bomb before it explodes. Boris and Natasha need a powerful reason to confess the location.

**Bargaining Powers**
After the bomb is hidden, it is Rocky and Bullwinkle’s move. They decide to barge into Boris and Natasha’s Pottsylvania home as a means of learning the bomb’s location. Bullwinkle suggests a brutal pounding with fluffy pillows until there’s a confession. Rocky is not convinced, opining that they would have more power if they use sticks.

Rocky is correct. In this negotiation, Rocky and Bullwinkle’s initial bargaining power is critical.

*Endowment power:* Rocky and Bullwinkle have sticks.

*Threat power:* Boris and Natasha understand that being hit with sticks would be intolerably painful.

*Risk tolerance:* Rocky and Bullwinkle do not have much risk tolerance they can leverage.

**Coalition power:** Rocky and Bullwinkle are partners, but so are Boris and Natasha. Our Frostbite Falls bomb confessional can be vastly altered via some savvy modes of action.

**Modes of Action**
Rocky and Bullwinkle want to know where the bomb is hidden, but Boris and Natasha need a powerful reason to confess the location.

Threatening Boris and Natasha with sticks would not be effective. Boris and Natasha would refuse to reveal the location because they would know that Rocky and Bullwinkle couldn’t go so far as to kill their nemeses. That would destroy the only knowledge of the bomb’s location. Nothing can be gained by Rocky and Bullwinkle’s threat.

Thinking ahead, Rocky and Bullwinkle improve the threat’s credibility by hiring a vicious thug. Rocky and Bullwinkle head into the house and tell Boris and Natasha that their hired help will extract the bomb’s location and has been told to do “whatever it takes.” Rocky and Bullwinkle depart for lunch at a diner down the road, planning to return in one hour to learn the result—either Boris and Natasha will be dead or they will have confessed. As Rocky and Bullwinkle open the door for the thug and leave for lunch, they remind Boris and Natasha of his horrendous reputation for “sloppy” confessions.

**Leveraging the Bargaining Powers**
Rocky and Bullwinkle have leveraged the four bargaining powers and made a credible communication to Boris and Natasha:

* Their endowment comprises sticks, not just fluffy pillows.
* A hired thug is significantly more fear-provoking than sticks, enhancing their threat power.
* Rocky and Bullwinkle have demonstrated tremendous risk tolerance by walking away without a deal in hand, showing that they can tolerate an outcome that does not include disclosure of the bomb’s location.
* Rocky and Bullwinkle have enlisted the partnership of a thug, thus expanding their coalition.

**Enhancing Credibility**
Perhaps even more powerfully, Rocky and Bullwinkle have employed several modes of action that enhance the credibility of their threat:

* With Rocky and Bullwinkle’s exit, communication would be severed between Rocky and Bullwinkle and Boris and Natasha, leaving Boris and Natasha with no negotiating alternative.
* The vicious thug has a reputation for “sloppy” confessions, and Boris and Natasha have no desire to experience his wrath.
* The thug has been mandated with negotiating power, albeit with almost no leeway.

Rocky and Bullwinkle can further enhance their threat by adding the element of brinkmanship: Rocky and Bullwinkle could move Boris and Natasha to a warehouse in Frostbite Falls. Boris and Natasha would be unaware of when the bomb would explode, but would know that they are exposed to its devastation. Rocky and Bullwinkle would have introduced the powerful motivator of brinkmanship.

Characters and character names associated with *The Rocky & Bullwinkle Show* are trademarked by DreamWorks Classics.
Assumptions lay at the foundation of investment analysis. Unfortunately, investors frequently fail to comprehend the assumptions. Or, they attempt to ignore the assumptions that they are making.

Sometimes we see what we want to see, as suggested by this illustration, patterned on an example provided by Richard Heuer. When you look at the figure below, what do you see?

The significance of any information is derived from the context within which it is interpreted.

It is for this reason that William Blair’s Dynamic Allocation Strategies team leverages game theoretical constructs. The intent is to develop theories that enable superior organization and interpretation of information.

*Seeing What We Want to See*

In each triangle the article at the end of the second line (i.e., to, a, and the) is repeated at the start of the third line. The phrases are common, so our perception shifts toward our expectation.

Look in the footnote below to see what is really there.
As with all fundamental information, the evidence garnered in the process of geopolitical analysis does not speak for itself. The constructs of game theory make assumptions explicit so that they can be examined and challenged objectively.

Game theoretical constructs do not eliminate the risk of making investment decisions. The soul of strategic negotiation is risk, created and responded to by players who are fallibly human. But, the interpretation of information through the lens of these constructs is accomplished with less bias. We are more likely to discern truth than see what we want to see.

If you’ve been building investment portfolios based on post-Cold War market behavior, without consideration for the new world order, it is possible that you have been seeing what you want to see—and missing opportunity in the process.

To learn more, we invite you to take advantage of William Blair’s additional game theory content designed to help you “get your head in the game.”

williamblairfunds.com/gametheory
To Read More About Game Theory


Footnotes


About William Blair Investment Management

William Blair Investment Management, the asset management business of William Blair & Company, L.L.C., is committed to building enduring relationships with our clients and providing expertise and solutions to meet their evolving needs. We work closely with private and public pension funds, insurance companies, endowments, foundations, sovereign wealth funds, high-net-worth individuals and families, as well as financial advisors. William Blair is 100% active-employee-owned with broad-based ownership. Our investment teams are solely focused on active management and employ disciplined, analytical research processes across a wide range of strategies, including U.S. equity, non-U.S. equity, fixed income, multi-asset, and alternatives. William Blair Investment Management is based in Chicago with offices in London, Zurich, and Sydney.

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