
Game Theory for Strategic Advantage

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Game Theory: over Time

- 1930s A branch of applied math
- 1940s An asset during WWII (*zero-sum games*)
- 1950s A lens through which to look at the Cold War (*deterrence*)
- 1960s “Imported” into the social sciences: politics, international relations (*threats & bargaining*)
- 1970s Evolutionary biology (*stable strategies*)
- 1990s Management (*bidding in auctions*)
- 2000s Market and auction design (*FCC, Google*)
- 2010s Networks & communication protocols



Cuba, 1962

- USSR begins placing missiles, planes in Cuba.
- Part of a broader geopolitical struggle (e.g. Berlin)
- ExComm contemplates military action (airstrike, invasion)
- JFK chooses blockade
- “Bargaining” begins, but blockade loose and missile sites almost ready
- JFK threatens action
- Day before airstrikes begin, Khrushchev agrees to trade “missiles withdrawal” for “no invasion.”

Cuba, 1962

Khrushchev

Hawk

Dove

JFK

Hawk

$(-10, -10)$

$(1, -1)$

Dove

$(-1, 1)$

$(0, 0)$



The Strategy of Conflict, 1960

- “It is sometimes argued that we need not threaten the enemy with the certainty of retaliation...
- ... but just scare him with the possibility that we may strike back.”



Cuba, 1962

p = prob. Khru *thinks* JFK plays “Hawk”

$p > 10\%$ → Khru should play “Dove”

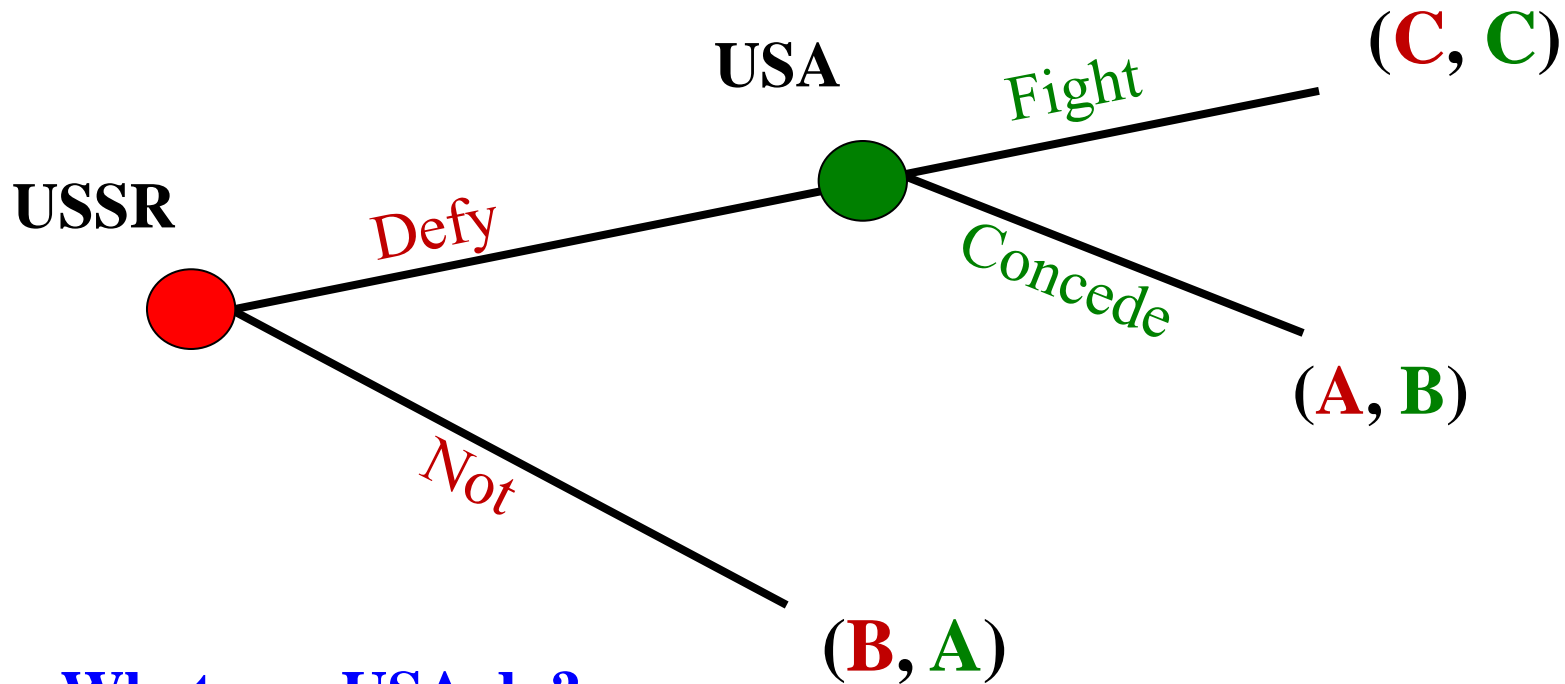
		<u>Khrushchev</u>	
		Hawk	Dove
<u>JFK</u>	Hawk	(-10 , -10)	(1, -1)
	Dove	(-1, 1)	(0 , 0)



The Strategy of Conflict, 1960

- “It is sometimes argued that we need not threaten the enemy with the certainty of retaliation...
- ... but just scare him with the possibility that we may strike back.”
- “This idea may be misconceived if that means confronting the Russians with a possible response that remains for us to decide, one way or the other.”
- ***I.e., Russians know where probabilities come from!***

JFK is not Crazy



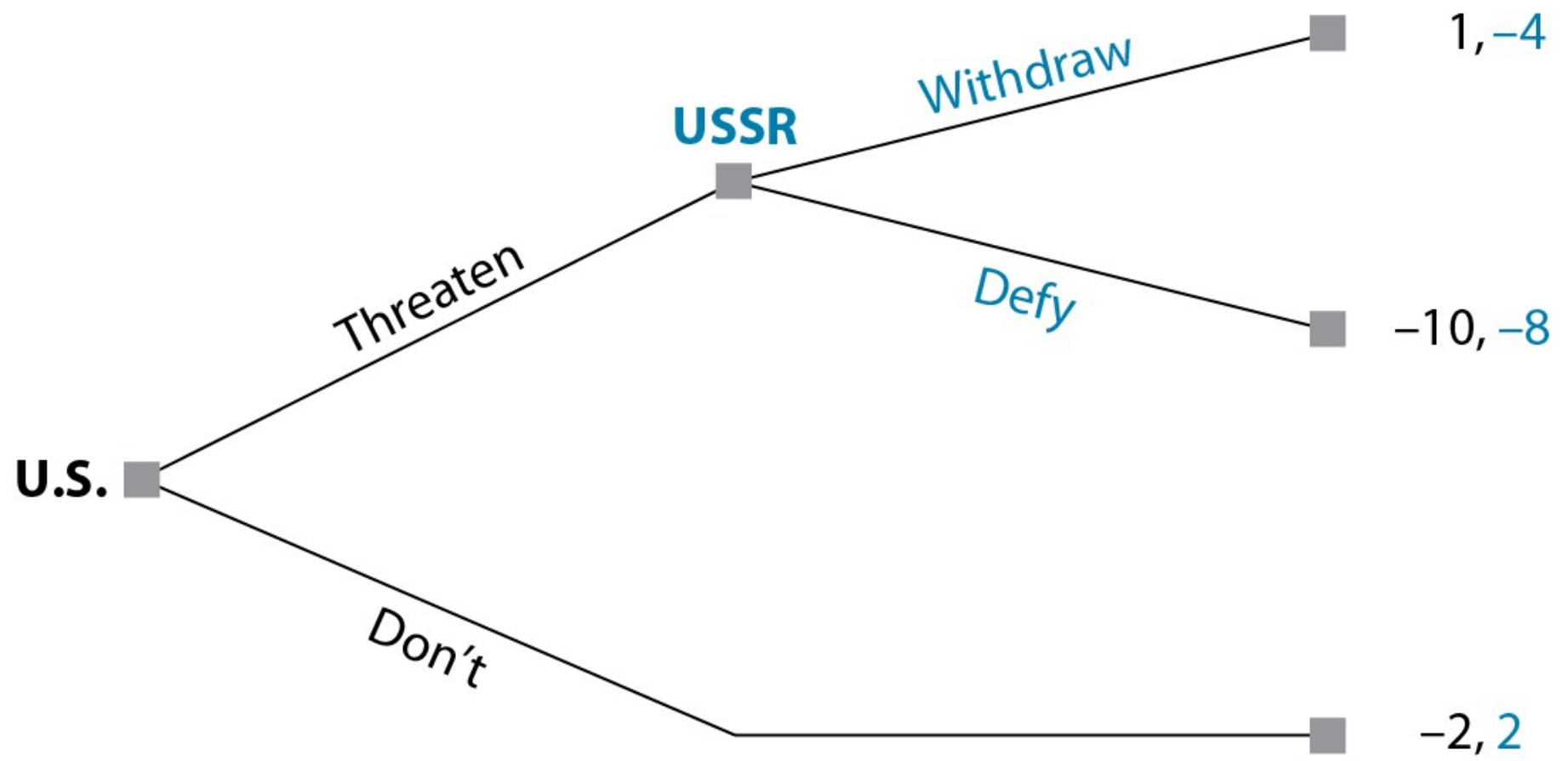
What can USA do?



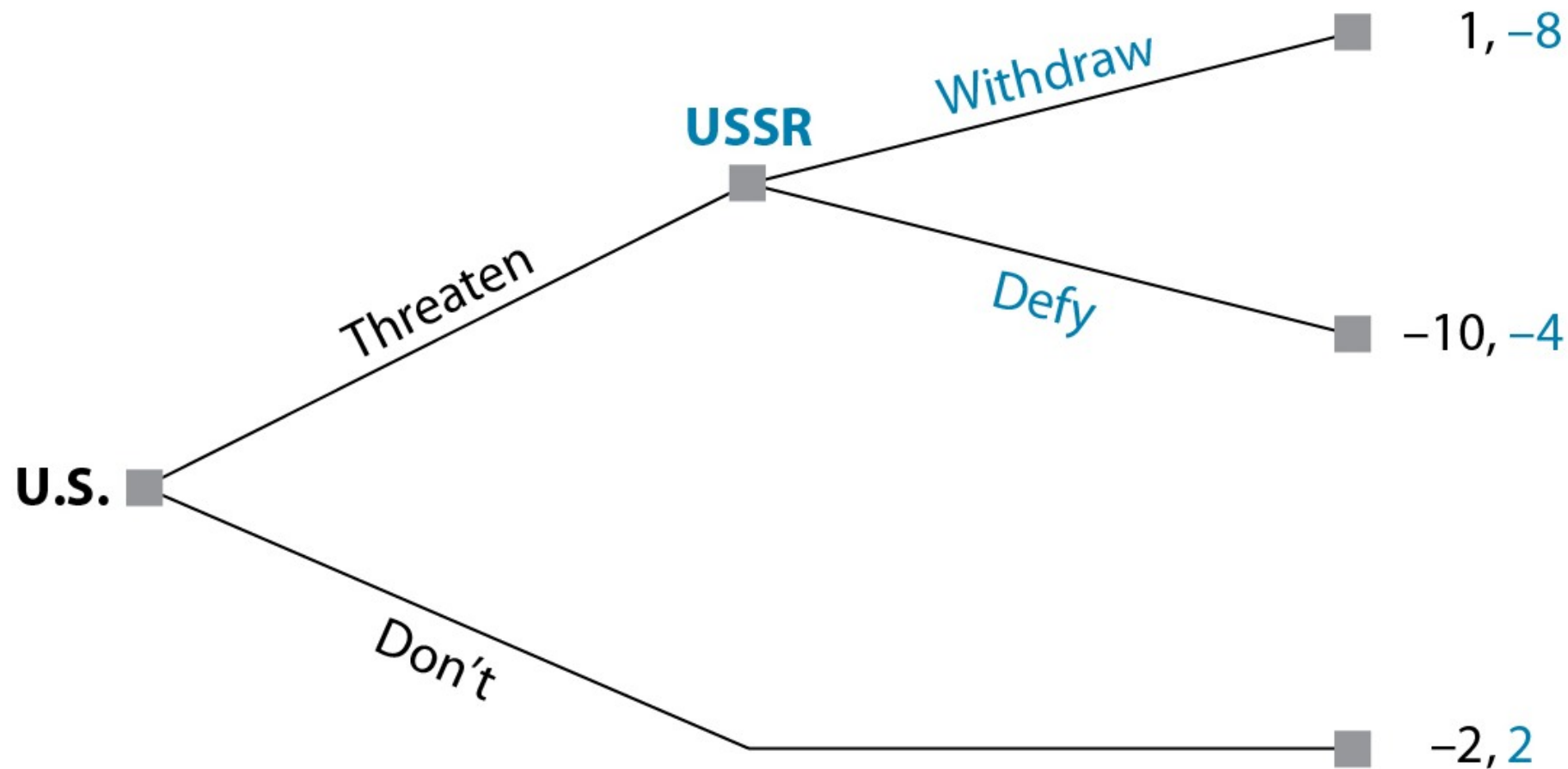
Game changer: should JFK commit?

- Pros
 -
 - Cons
 - ...
-
- Is it even possible? How about a threat?
 - If so, is it optimal?

Khrushchev is normal too...

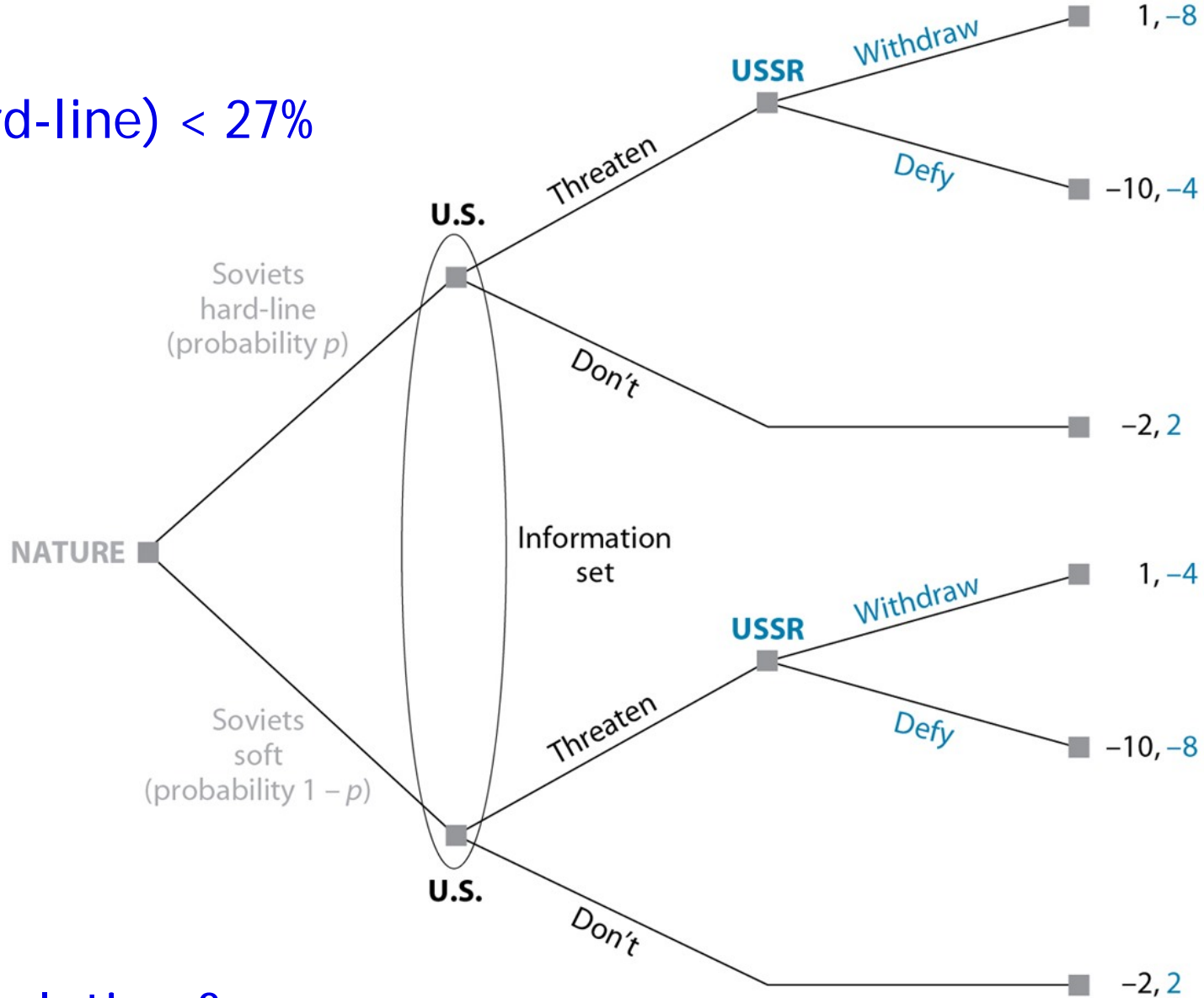


... but if Khrushchev is not in control ...



What odds can U.S. tolerate?

Pr(hard-line) < 27%



Other solutions?

Committing to Randomness

“But I’m a superstitious man, and if some unlucky accident should befall him, if he should get shot in the head by a police officer or if he should hang himself in his jail cell or if he’s struck by lightning, I’m going to blame some of the people in this room. And that, I do not forgive.”

The Godfather



Brinkmanship: theory

- “The deliberate creation of a recognizable risk of war, a risk that one does not completely control.”
- Deliberately letting the situation get somewhat out of hand, in a way that is intolerable to the other party, forcing his accommodation.
- “It may make sense to try to keep the enemy guessing as long as we are not trying to keep him guessing about our motivation.”



Brinkmanship: practice

- Links between orders and implementation?
- Naval blockade: who's in charge?
- U-2 reconnaissance planes: “accidental drifts”?
- Russian submarine commanders?

$q = \Pr(\text{US “retaliates” if USSR defies})$



Defy still dominant for hard-liners

$q > 60\%$ → soft Soviets withdraw

Brinkmanship optimal if

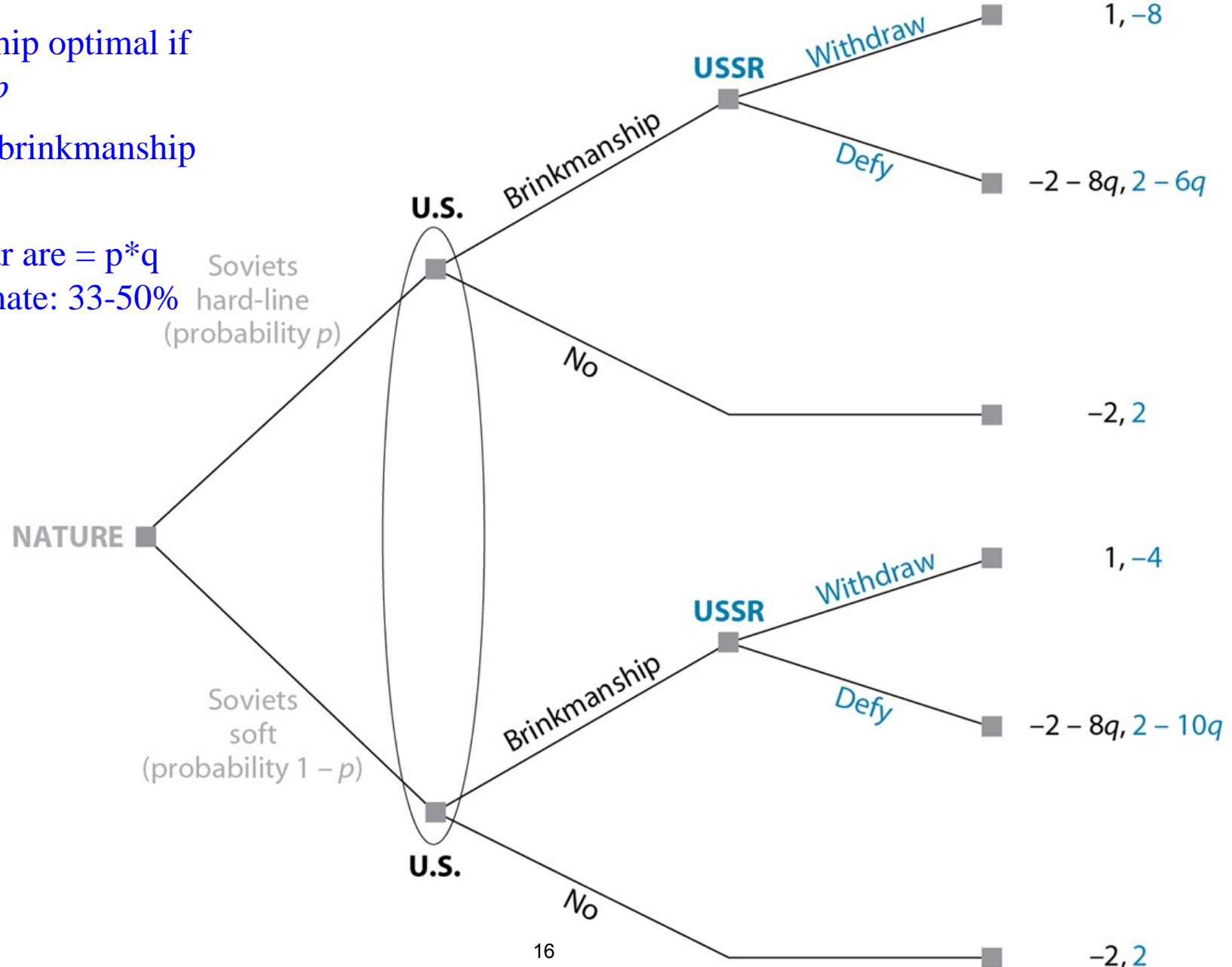
$q < 3(1-p)/8p$

Successful brinkmanship

if $p < 38\%$

Odds of war are = $p \cdot q$

JFK's estimate: 33-50%



Nobel Lecture 1

- The most spectacular event of the past half century is one that did not occur.
- We have enjoyed sixty years without nuclear weapons exploded in anger.
- There has never been any doubt about the military effectiveness of nuclear weapons or their potential for terror [but these] weapons remain under a curse.
- This attitude is an asset to be treasured.

Unused moves create incentives



Nobel Lecture 2

- 1953: in the event of hostilities, the United States will consider nuclear weapons to be as available for use as other munitions.
- Saying so cannot make it so; tacit conventions are sometimes harder to destroy than explicit ones.
- 1962: There is no such thing as a conventional nuclear weapon. [Their use] is a political decision of the highest order.

Equilibrium = stable, self-enforcing outcome



Nobel Lecture 3

- This argument emphasized bright lines, slippery slopes, well defined boundaries, and the stuff of which traditions and implicit conventions are made.
- (The analogy to “one little drink” for a recovering alcoholic was sometimes heard.)
- The conclusion: nuclear weapons, once introduced into combat, could not, or probably would not, be contained, confined, limited.

Think (the whole way) forward, look back



Nobel Lecture 4

- Conventional buildup in Europe was the most important East-West arms understanding.
- Arms control is often identified with limitations on the possession or deployment of weapons.
- Reciprocated investment in non-nuclear capability was a remarkable instance of unacknowledged but reciprocated arms control.
- It is not only potential restraint in the use of nuclear weapons; it is investment in a configuration of weapons to make them capable of non-nuclear combat.

Nobel Lecture 5

- I expect that we may come to a new respect for deterrence.
- If Iran should acquire a few nuclear weapons, we may discover again what it is like to be the deterred one, not the one doing the deterring.
- (I consider us as having been deterred from intervening in Hungary in 1956 and Czechoslovakia in 1968.)
- I also consider it crucial that Iran' leaders, civilian and military, learn to think, if they have not already learned to think, in terms of deterrence.

There is always a larger game!

Nobel Lecture 6

- What else can Iran accomplish, except possibly the destruction of its own system, with a few nuclear warheads?
- Nuclear weapons should be too precious to give away or to sell, too precious to waste killing people when they could, held in reserve, make the United States, or Russia, or any other nation, hesitant to consider military action.
- What nuclear weapons have been used for, effectively, successfully, for sixty years has not been on the battlefield not on population targets: they have been used for influence.

Play for the Long Run!

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15.025 Game Theory for Strategic Advantage
Spring 2015

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