



The World Cup Hacker's Handbook

A human touch to prediction

We adopt a quantitative model for predicting the 2014 football World Cup winner, and then apply some well reasoned arguments to find the likely winner. Thanks to large presence of Liverpool players in the squad, England comes out as our predicted winner. The fact that one of the authors supports both teams is mere coincidence.

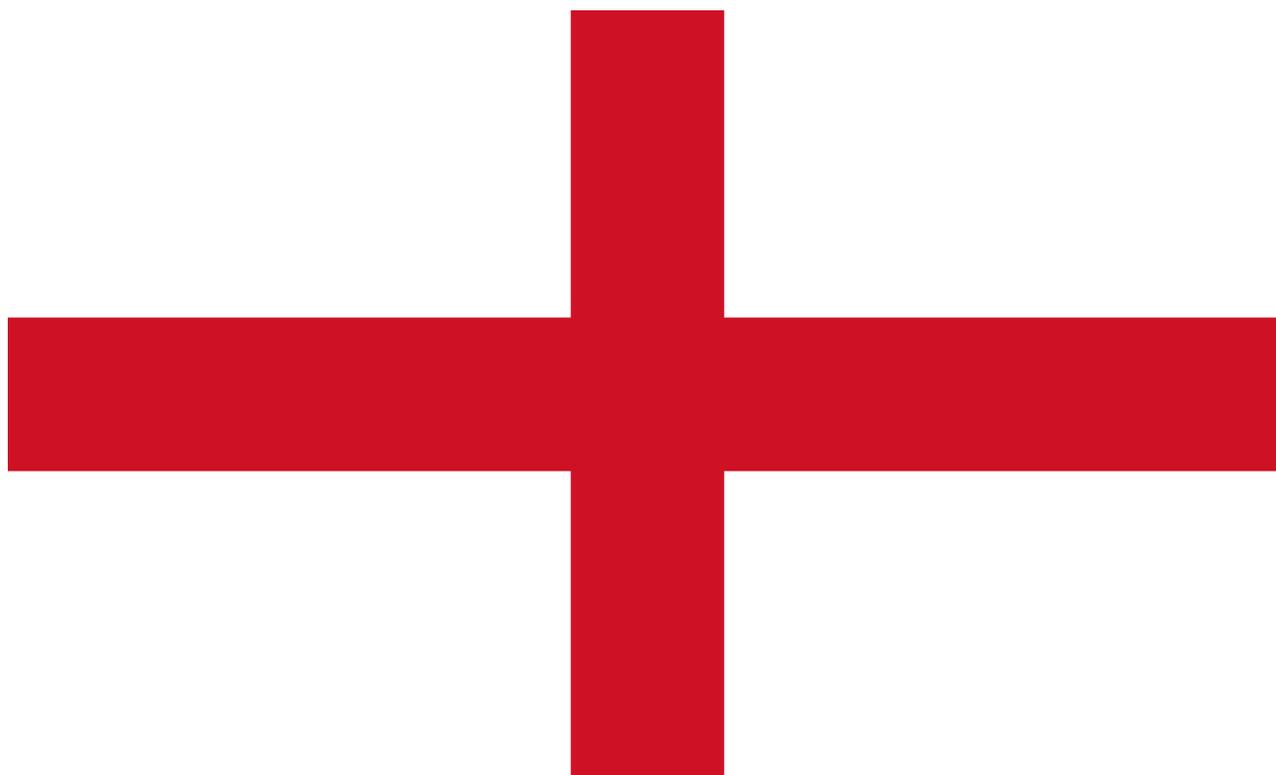
Interviewing failure

All too often winning players are interviewed for their insights into the World Cup. But we think such a selection bias, which is rampant in the financial industry, needs to be balanced. So we interview a loser – our very own Henrik Gullberg. He played for the Swedish international youth squad, but never made it to the “grown up” team.

The serious stuff

For those of a more serious bent, we really do construct a quantitative model to predict the winner of the World Cup. Brazil naturally comes out top. But we find that market odds are under-pricing Switzerland, France and Portugal

Figure 1: England's time has come



Source: Deutsche Bank, WikiCommons



Our Hacker's Handbook

Part 1: The Winner

Prepare to be surprised

All roads seem to lead to Brazil winning the World Cup. Home advantage, past record, and form are but a few of the tailwinds. Naturally, market odds and our own quantitative models come to the same conclusions (see Part 3). But remember at the start of 2014, everyone thought US yields would go up, Ukraine was only a concern for EM specialists and Barcelona would win the Spanish league for the fifth time in six years. With US yields noticeably down, Ukraine the biggest geo-politic hotspot in the world and Atletico Madrid celebrating their first league title in almost twenty years, this year's World Cup looks ripe for an upset.

We have a model

The starting point to determine the winner of the World Cup has to be to look at some combination of rankings, past form, players and market odds. We use a quantitative approach using these inputs to spit out a first cut of likely winners (see Part 3 for details). Our models point to Brazil having most chance of winning followed by Germany, Spain, and France. But to leave it at that would be boring and too conventional. So we introduce what some would call our bias but we like to think of as a discretionary overlay.

Models break down

To begin with, we note that since the inception of the World Cup in 1930, there is a pattern to runs of different teams winning the Cup. On three occasions, we have had four consecutive World Cups when different teams have won, and on another three occasions we have had two consecutive World Cups where different teams have won. So to make this sound more scientific, we have a bimodal distribution of "runs". The latest "run" started in 2002 with Brazil winning, then 2006 with Italy winning and in 2010 Spain winning. If statistical history is anything to go by, this World Cup has to be won by a different team, so that we have a run of four consecutive World Cups won by different teams. That means Brazil, Spain and Italy are not going to win the World Cup. From our models, we're then left with Germany, France, Argentina, Netherlands, Portugal, Uruguay and England as possible winners.

Figure 2: All-Time Top Level English Football League

Rank	Team	Played	Won	Pt
1	Liverpool	3944	1829	5315
2	Arsenal	3944	1781	5252
3	Everton	4328	1769	5135
4	Manchester United	3588	1709	5048
5	Aston Villa	3994	1630	4657
6	Chelsea	3208	1276	3936
7	Tottenham Hotspur	3204	1300	3910
8	Manchester City	3430	1322	3843
9	Newcastle United	3312	1294	3758
10	Sunderland	3226	1238	3404

Source: Deutsche Bank, stato.com

Figure 3: Runs of Consecutive World Cups With Different Winners Are Either 2 or 4. Same this time?

No. Of different countries in each run	1	2	Latest (3)	4	5
Winners	n/a	Bra ('62) Uru ('30) Eng ('66) Ita ('34)	Bra ('02) Ita ('06) Spa ('10) ?	Ita ('38) Bra ('70) Arg ('86) Uru ('50) Ger ('74) Ger ('90) Ger ('54) Arg ('78) Bra ('94) Bra ('58) Ita ('82) Fra ('98)	n/a

Source: FIFA



Drilling down

Narrowing it down, the record shows that every team that has won the World Cup has gone on to either win another Cup or at least reach the final. The exception is England, which significantly tilts the odds in its favour. Moreover, most analyses tend to miss out player-by-player analysis of World Cup squads. It is noticeable that the most well represented team in the England squad is Liverpool with six players, this author's favorite club. In the last World Cup, it was Tottenham Hotspur, so it was no wonder that England did not do well. The fact that Liverpool is most represented is significant for two reasons. First, Liverpool is the most successful English club team having won more top-flight matches than any club (yes, including Man U); they have also won 5 European Champions Cups – more than any other English Club. Second, and most intriguingly the last time the England squad was dominated by Liverpool was ...1966.

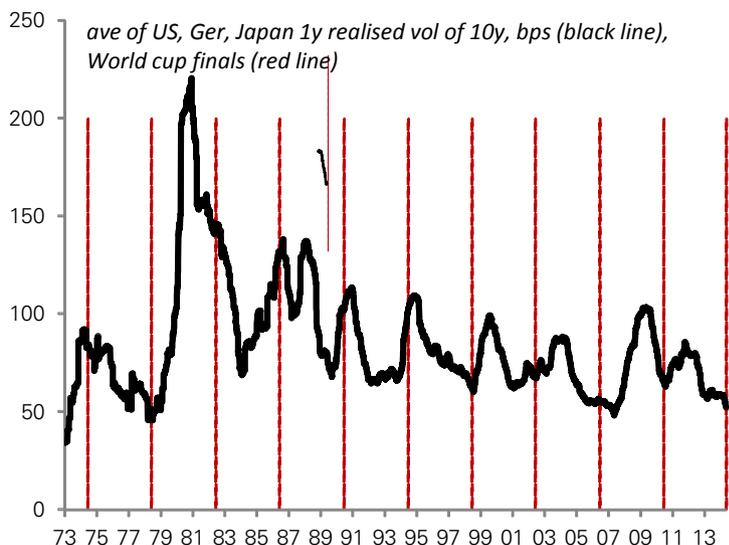
En-ger-land

To reiterate, England are amongst the best teams according to our static model. The history of World Cup winning runs suggest that England is amongst the teams that could this World Cup. Within this group of teams, England is the only one that has won a World Cup and not reached another final. And the last time England had so many Liverpool players in the team, it won. Therefore, we are confident that England will win this World Cup.

Moving on to the smaller matter of market implications, we confirm that there is a small equity market impact for winning teams. More interesting, though, is that rates volatility tends to reverse course after the World Cup (see chart). It may be wishful thinking, but we hope this relationship holds true.

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Figure 4: Rates Volatility Tends To Reverse Course Around World Cups



Source: Deutsche Bank, MacroBond



Part 2: The Interview

Henrik Gullberg is a member of the global FX research team focusing on EMEA and Nordics FX. While many know him for his research output, he used to play football for the Swedish youth squad. Most prefer to interview winners, but to avoid this selection bias we have chosen a failure closer to home.

Henrik Gullberg: Failed Footballer,
Successful Strategist



Source: Deutsche Bank

Q: You played for Sweden at international level when you were younger, can you tell me more about that?

HG: Yes, 11-12 caps. And 3-4 goals, one of them against the mighty Spain in a European qualifier. I remember that one like it was yesterday! Sadly we lost 2-0 away, and 4-3 on aggregate, but 3-4 goals are not bad for a central defender/defensive midfielder!

Q: So to be clear, you didn't play for the grown-up Swedish international side?

HG: Unfortunately not, just for the boys' team, from the age of 15 and over the following couple of years.

Q: What stopped you from progressing to the real international side?

HG: Maybe I lost my focus/determination, at least sufficiently take that next step. But let's not forget the competition is hard, as most lads who can kick a ball want to play for their country. From my team, the only one made it to the senior international side was the goal keeper, Magnus Hedman, who went on to play for Celtic, Coventry, and some Italian club before winding down as 3rd choice keeper at Chelsea one season.

Q: We can learn a lot from winners, but we can also learn a lot from losers. So tell us some things you have learnt from being a loser?

HG: Ha, well, losers are much more interesting are they not? After all, the reason they are losers is that they probably have had more fun than the supposed winners. To be a 'winner', in sports at least, you must forsake [too] many of the good things in life.

Q: Are there any parallels between playing football and forecasting the Swedish krona?

HG: Hmm... for an uninitiated eye playing football might seem simple; after all you are just kicking a ball. But there are a lot of variables -- a diagonal run can free up space for your team mate, a pass that seems pointless might be designed to tempt the opposition out of position. Forecasting currencies, SEK included, also involves many moving parts: Monetary policy, carry, safe haven flows, commercial demand, M&A, technicals, etc. This means it is impossible to be overly confident, both in football and FX.

Q: I see that Ghana, Australia and Korea are in this year's World Cup, how come Sweden didn't make it?

HG: Australia and Ghana have populations of 20-25 mn, Korea around 50mn, Sweden's is less than 10mn. History shows that population size is a key contributor to consistent success at the World Cup. Hence, for smaller nations it always goes in cycles. In the 1950s Sweden was very good (Olympic Gold 1948, 3rd 1950, 2nd in 1958), rubbish in the 1960s, decent in the 1970s, then rubbish again in then 1980s, before reaching the semis of the 1992 European



Championship and finishing 3rd in the 1994 World Cup. Predictably the last 10 years have since seen a gradual decline.

Q: Winning the 2013 King's Cup probably makes up for not qualifying. Tell us more about how Sweden played against the only other teams in the tournament: Thailand, North Korea and Finland?

HG: Um, absolutely... winning the Kings Cup is something most Swedish football fans treasure immensely. No, not really. I was not even aware of something called the King's Cup before you mentioned it. But considering the opposition they probably could accommodate an FX strategist in central midfield.

Q: The King's Cup is always held in Thailand. Some would say it's an excuse for Swedes to holiday there. Is that true?

HG: It could be. While I do not particularly rate Thailand as a footballing nation, I am one of many Swedes who love it as a holiday destination. Thailand was one of my stops on an Asian tour with friends in my late teens. Come to think of it, that is probably also a good example of why I did not make the 'grown-up' Swedish international side.

Q: As a Swede, what makes you more proud, coming third in the 1994 World Cup, or coming second in the 1958 World Cup?

Both. Although obviously the 1994 is a greater memory since I followed it in real-time.

Q: There have been some epic matches in World Cup history: Zico's Brazil vs Rossi's Italy in 1982, Argentina vs England in 1998 and Pele's Brazil vs Italy in 1970. For Swedes, your greatest game is probably against Romania in the 1994 quarter-finals. Would you put that in the top 10 all-time greats?

HG: Yep, must be up there. Having said that, regardless of nationality, the 1982 Brazil team will always be cherished for their nonchalant and carefree way of playing, like it did not matter too much. A colleague of mine from Brazil said World Cup football died when Italy knocked them out. I see his point.

Q: Sweden is one of the most egalitarian societies in the world. Some say that has resulted in the team's players never wanting to stand out, by for example scoring a goal. Is there some truth in that?

HG: Probably yes. Swedish sporting success generally has been based on tactical discipline, resilience and being a team. This maybe invariably comes at the expense of flair and flamboyance. Having said that, if you are tactically shrewd, resilient and a real teamplayer, you often end up standing out anyway. Henrik Larsson was a good example of someone who stood out on the pitch just by being all those things.

Q: Indeed, some of the best Swedish players of all-time include Henrik Larsson, Sven Rydell, and Tomas Brodin. Currently, the best player is Zlatan Ibrahimovic. He doesn't sound very Swedish. Tell us more about him.

HG: He might not sound very Swedish, but I think these days he probably is. And he is not the only one not-Swedish-sounding player in the national team these days. Others are not nearly as well known, but there is a Durmaz and a Zengin in there as well. Plus in the Swedish U-17 team that finished 3rd in the World Cup recently, half the team had surnames not sounding particularly



Swedish, such as Lipovac, Berisha, Rekip, Saletros, Sonko, Suljic and Ssewankambo.

This is simply a reflection of our society these days. Around 15% of the Swedish population is foreign born, 5% were born in Sweden but to parents from abroad, and another 7% were born in Sweden to one parent from abroad. In other words, almost 1/3 of the Swedish population is at least partly of foreign descent. So in the squad for the next World Cup, if we get there, there will probably be at least 7-8 "Ibrahimovics."

Q: Finally, who's your pick for the worst team of this World Cup?

HG: I would not wager on Russia. Historically Russian footballers have not "travelled well," and this World Cup is played far from Russia. Also, the Russian World Cup squad stands out because they only have domestically based players. Generally, World Cup success over the past 20-30 years attests to the importance of having players plying their trade in leagues other than at home, or if they do play in the domestic league, that they play for the top European clubs. Russia has neither.

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Part 3: A More Serious Take

What the FIFA ranking tells us

There have been a number of studies on what determines the success of countries in international football, most (but not all) of which has come to the conclusion that success is at least partially explained by factors such as per-capita GNP, the number of formally registered player, and certain geographical, political and cultural influences. However, while these relationships certainly are relevant when looking at historical trends, and more importantly, when explaining why certain nations have been more successful than others over time, they will not necessarily give valuable insights into which nations are more likely than others to do well at this specific World Cup.

For that we prefer to look at variables that give us an idea of: a) the level and consistency of a team's performance in recent years; b) the historical prowess of doing well on the biggest stage of world football; c) how strong the home/continent bias has been over the years; and maybe most importantly d) the talent pool, or rather the current strength of the available pool of players for the nations partaking in the World Cup.

To capture the level and consistency of performance in recent years of the teams participating in the World Cup, the most obvious thing to look at would be the FIFA World Ranking, which ranks nations on their performance over the past four years, with competitive games against strong opposition yielding more points than friendly games against weaker squads. Simply looking at the number of points that say the number one ranked team, Spain, has accumulated since the last World Cup in 2010, over the total number of points accumulated by all the teams participating, then gives us a simple probability of Spain winning the World Cup.

If we then take the strength of the groups into account by penalizing/awarding teams with a points tally smaller/larger than the group and total World Cup averages, this results in a simple probability rank adjusted by a team's [un]luck in the draw. In the table on the right we present this table of probabilities from the most to the least favorite to win this year's tournament. As one can see, reigning world champion Spain sits atop the table, with a 6.4% probability of winning, followed by Germany and then hosts Brazil and neighboring Argentina. It should be noted, however, that hosts Brazil are at a disadvantage on this metric, since them hosting the World Cup means they have not had the same opportunity to accumulate FIFA ranking points in competitive games over the past few years (i.e. in World Cup qualifiers). At the other end, our calculations suggest Australia have only a microscopic 0.3% probability of ending the tournament as world champions.

Probability ranking based on the FIFA World Ranking – adjusted for the strength of the group:

Spain	6.41%
Germany	5.35%
Brazil	5.13%
Argentina	5.10%
Colombia	4.83%
Portugal	4.72%
Switzerland	4.71%
Uruguay	4.48%
Belgium	4.20%
Greece	4.13%
Italy	4.04%
Chile	3.58%
England	3.56%
Russia	3.29%
France	3.20%
USA	3.18%
Netherlands	3.11%
Mexico	2.90%
Croatia	2.86%
Algeria	2.57%
Bosnia and Herzegovina	2.54%
Côte d'Ivoire	2.45%
Ecuador	2.26%
Honduras	2.02%
Iran	2.01%
Costa Rica	1.59%
Nigeria	1.44%
Ghana	1.16%
Japan	1.00%
Cameroon	0.94%
Korea Republic	0.94%
Australia	0.29%

Source: Deutsche Bank



The World Cup, a 'home run' for Brazil?

However, the FIFA ranking only goes back four years, which would not take into account the strong historical or traditional aspect of the tournament, where only a handful of countries actually have won the World Cup. Looking at historical performance, we not only award the champions, but also reward points for reaching the 2nd round, quarters, semis, as well as beaten finalists.

Assessing the record of nations who qualified for this tournament according to a progressive points system, you get additional points for every stage that you manage to reach (divided by the number of times qualified). As is evident from the table below, hosts Brazil then come out on top with a 16.4% probability of ending the tournament on home soil as world champions, followed by Germany, then Argentina, Uruguay and Italy. At the bottom end of the table we find Bosnia, the Ivory Coast, Greece and Iran, who have all qualified twice but never managed to get through the group stage.

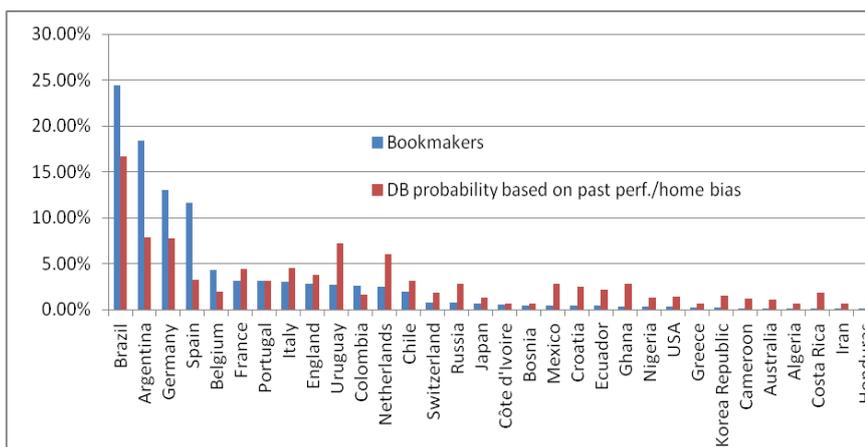
Linked to historical performance in the World Cup is the location of the World Cup, with home advantage arguably having been a key factor in the past, although only four World Cups since 1950 have been won by the host nation. However, in those 16 World Cups, the hosts advanced to at least the semi-finals in all but six World Cups. Maybe also of importance, countries in close proximity to the hosts have typically also done well, as witnessed by Uruguay winning the World Cup in Brazil in 1950, Brazil winning the 1962 tournament in Chile, and in Mexico 1970, while World Cups on European soil have typically been won by European sides, the 1958 World Cup in Sweden the exception (won by Brazil).

To account for home advantage, then, we look at host nations' performance vis-à-vis their performance when the World Cup was held elsewhere. The results evidence a clear advantage, with host nations on average reaching almost two rounds further compared with when they are not playing at home. Extending this to neighboring countries as well, 12 out of the 16 post-war World Cups have been won by either the hosts or a nation from the same continent. Moreover, of the 4 exceptions, only really Brazil winning the 1958 World Cup (Sweden) which stands out, as the other three 'out-of-continent' World Cup winners, Brazil in 1994 and 2002, and Spain in 2010, were more expected since those World Cups took place on continents with no established or traditional footballing prowess (USA 1994, Japan/South Korea 2002 and South Africa 2010).

Probability ranking based on historical performance at the World Cup:

Brazil	16.7%
Argentina	7.9%
Germany	7.7%
Uruguay	7.2%
Netherlands	6.0%
Italy	4.5%
France	4.5%
England	3.8%
Spain	3.2%
Portugal	3.1%
Chile	3.1%
Ghana	2.8%
Russia	2.8%
Mexico	2.8%
Croatia	2.5%
Ecuador	2.2%
Belgium	2.0%
Switzerland	1.9%
Costa Rica	1.8%
Colombia	1.6%
Korea Republic	1.5%
USA	1.4%
Japan	1.3%
Nigeria	1.3%
Cameroon	1.2%
Honduras	1.1%
Australia	1.0%
Côte d'Ivoire	0.6%
Bosnia	0.6%
Greece	0.6%
Algeria	0.6%
Iran	0.6%

"Big Three" Bookmakers winning probabilities* – strong 'home' bias



Source: Deutsche Bank, William Hill, Coral, Ladbrokes *adjusted for the overround

Source: Deutsche Bank



The talent pool

Obviously, the available pool of players for each country also matters.

While there is no perfect way of doing this, one relatively objective way is to look at the number of players currently active or at least being part of club squads at the highest level. Looking at the top European leagues, and how many players the World Cup participating nations contribute with to their clubs would be one way of capturing the strength of the current national pools. The number of points awarded to each nation in our approach depends not only on the number of players in the seven top European leagues, but also which league the players are currently active in, with slightly bigger weights attached to, the more competitive and wealthy La Liga, Premier League and Bundesliga, followed by the Seria A, Ligue 1 and Primeria Liga, and finally the Dutch Eredivisie.

Finally, we only count 50% of the domestic players towards the quota for that particular country (i.e., only 50% of English players are counted towards England's quota of players in the Premiership and so on), on the basis that the bottom 50% of domestic players in any domestic league are not really competing for a place in the national team, rather their more precious asset is that they are just that, domestic.

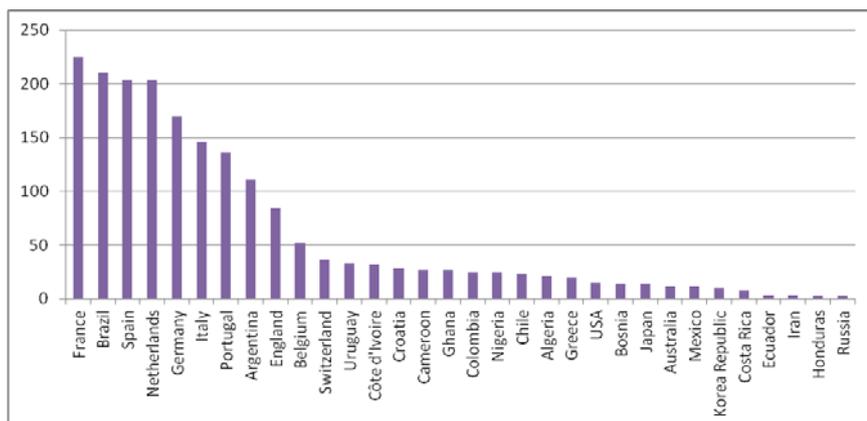
While data on the nationality of players in foreign leagues is not always available, in particular not going back for more than the past couple of World Cups, it is possible to point at World Cup success over the past 20-30 years as 'evidence' for the importance of either having players plying their trade in leagues other than their domestic league, or if they do play in the domestic league, that they are good enough to play in the top clubs. Argentina, Brazil, France and Netherlands would fit into the first category, while England, Germany and Italy typically have more domestically based players. Spain, meanwhile, fits nicely into both camps, with a large number of players from the domestic giants Barcelona and Real Madrid, but also many players at top clubs in foreign leagues (David Silva at Manchester City, Thiago Alcantra and Javier Martinez at Bayern Munich, Juan Mata and David de Gea at Manchester United, Cesar Azpilicueta and Fernando Torres at Chelsea, just to name a few). Based on this measure, Spain in particular, but also France, Brazil and Germany have a substantially larger pool of talent to draw from and therefore are more likely to do well at the World Cup, than is the case for the rest, with a clear gap between the top 4 and the next nearest contenders: Italy, Portugal, Argentina, England and Netherlands, in that order.

Probability ranking based on the number of players in competitive leagues:

Spain	13.0%
France	11.4%
Brazil	10.9%
Germany	10.5%
Italy	7.2%
Portugal	6.9%
Argentina	6.1%
England	5.4%
Netherlands	5.2%
Belgium	2.3%
Switzerland	2.1%
Uruguay	1.8%
Côte d'Ivoire	1.7%
Croatia	1.5%
Cameroon	1.5%
Colombia	1.3%
Nigeria	1.3%
Ghana	1.3%
Chile	1.2%
Greece	1.1%
Algeria	1.1%
USA	0.9%
Japan	0.8%
Bosnia and Herzegovina	0.8%
Mexico	0.7%
Korea Republic	0.6%
Australia	0.6%
Costa Rica	0.4%
Ecuador	0.1%
Iran	0.1%
Honduras	0.1%
Russia	0.1%

Source: Deutsche Bank

Talent pool – Players in top European leagues (we only count 50% of domestic players counted towards the quota in the domestic league)



Source: Deutsche Bank



The long shot, the value trade, and the insider tip

The table on the right shows that bookmakers' odds reflect strongly the home/continent bias, with the first World Cup in South America since 1978 (in Argentina) firmly expected to be won by Brazil, with a probability of 24.5%, and with neighboring Argentina the expected runner-up with a winning probability of 18.4%. They are followed by Germany at 13.1% and Spain at 11.6%. There is then a big jump down to the rest, with 'fancied' Belgium best of the rest with a probability of 4.3%, followed by Portugal and Italy at 3.1% and 3.1% respectively, and then England at 2.8% just before Uruguay and the Netherlands at 2.7% and 2.5% respectively. How do these odds compare with our probabilities, and where can we find 'good' value?

Of the near contenders France in particular, but also the Netherlands seem underpriced, while further down the ranking Ghana, Croatia and Switzerland all look attractive from a "valuation" perspective, with their winning probabilities according to bookmakers some 80% below our own weighted probability. A quick look at the draw, and the lower half of the draw suggests bets on the winner of Group E to reach at least the quarters are particularly attractive (France or Switzerland). The group looks relatively manageable, and the winner goes on to play the runners-up from Group F, which if Argentina expectedly tops the group, would be one of Bosnia, Iran or Nigeria. Alternatively Portugal, who are arguably also 'underpriced', in particular if you compare with our probability rank based on the "Players' pool," and were Portugal to win Group G ahead of perennial favorites, but also injury ravaged and in recent years sometimes defensively suspect, Germany, then they would play the runner-up from Group H (Algeria, Belgium, Russia, South Korea), before coming up against the winner of the quarterfinal between the winner of Group E (assume France or Switzerland) and runner-up in Group F (likely Bosnia, Iran or Nigeria).

The bottom line, then, is that 'value' investors should look for a surprise from the lower half of the draw (Portugal, France or Switzerland):

- **The real "long shot" is Switzerland** at 100/1 to win, and a still respectable 3/1 simply to reach the quarterfinals. It received a favorable draw and fields a decent squad decent, with a number of players in clubs such as Juventus, Napoli, and Bayern Munich.
- **The "good value" trade is France** at 25/1 to win. Most of its team are at top clubs around Europe, and have played key roles for their teams this past season. Also, or probably therefore, it appears to be the most 'underpriced' team on our metrics.
- **"The "insider tip" is Portugal** at 25/1 to win. With Ronaldo in goal-scoring form and a decent keeper, strong defence, and solid midfield, there appears to be no material defect in the team. They also share language/culture with the hosts, so winning probabilities arguably fail to take account of what should be a home/continent bias.

Good luck to them all!

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Where can we find good value?

	DB probs	Bookmakers*	Dear'/Cheap
Brazil	12.04%	24.47%	12.43%
Germany	8.33%	13.05%	4.72%
Spain	7.78%	11.61%	3.83%
France	7.00%	3.18%	-3.82%
Argentina	6.59%	18.35%	11.76%
Italy	5.48%	3.07%	-2.41%
Netherlands	5.12%	2.46%	-2.66%
Portugal	4.97%	3.08%	-1.89%
Uruguay	4.52%	2.73%	-1.79%
England	4.38%	2.83%	-1.55%
Switzerland	2.54%	0.75%	-1.79%
Belgium	2.53%	4.28%	1.76%
Chile	2.45%	1.97%	-0.49%
Croatia	2.18%	0.48%	-1.70%
Colombia	2.15%	2.59%	0.45%
Mexico	1.97%	0.49%	-1.48%
Ghana	1.86%	0.38%	-1.48%
Russia	1.82%	0.73%	-1.08%
USA	1.56%	0.29%	-1.26%
Greece	1.51%	0.26%	-1.25%
Côte d'Ivoire	1.42%	0.52%	-0.90%
Ecuador	1.39%	0.41%	-0.98%
Nigeria	1.31%	0.32%	-0.99%
Cameroon	1.23%	0.11%	-1.12%
Algeria	1.20%	0.06%	-1.14%
Costa Rica	1.20%	0.04%	-1.16%
Bosnia and Herzegovina	1.09%	0.49%	-0.60%
Japan	1.04%	0.66%	-0.37%
Korea Republic	1.03%	0.21%	-0.82%
Honduras	0.90%	0.03%	-0.87%
Iran	0.71%	0.03%	-0.68%
Australia	0.71%	0.07%	-0.63%

Source: Deutsche Bank
*adjusted by removing the overround



Appendix 1

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