Package ‘mlbstats’

March 16, 2018

Type Package
Title Major League Baseball Player Statistics Calculator
Version 0.1.0
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Description Computational functions for player metrics in major league baseball including batting, pitching, fielding, base-running, and overall player statistics. This package is actively maintained with new metrics being added as they are developed.
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Encoding UTF-8
LazyData true
RoxygenNote 6.0.1
NeedsCompilation no
Repository CRAN
Date/Publication 2018-03-16 09:15:57 UTC

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**ab_hr**

Calculates at bats per home run

**Description**
Takes number of at bats and divides by number of home runs

**Usage**

`ab_hr(ab, hr)`

**Arguments**

- `ab` Number of at bats
- `hr` Number of home runs
Value

ab_hr

Examples

ab_hr(400, 25)

---

*aera*  
*Calculates adjusted earned run average (ERA+)*

**Description**

Computes adjusted earned run average accounting for park factor and league era (compare with "era" which is the traditional formula for earned run average, "erc" which is the component earned run average, or "dice" which is the defense-independent component earned run average).

**Usage**

*aera(er, ip, lera, home_rs, home_ra, home_r, road_rs, road_ra, road_r)*

**Arguments**

- **er**: Number of runs that did not occur as a result of errors or passed balls
- **ip**: Number of innings pitched
- **lera**: Average league ERA
- **home_rs**: Number of pitcher's team runs scored at home park
- **home_ra**: Number of pitcher's team runs allowed at home park
- **home_r**: Total number of runs scored at home park
- **road_rs**: Number of pitcher's team runs scored at away park
- **road_ra**: Number of pitcher's team runs allowed at away park
- **road_r**: Total number of runs scored at away park

**Value**

*aera*

**Examples**

*aera(10, 5.5, 2.5, 8, 7, 15, 6, 4, 10) # for a pair of games (one away, one home)*
Calculates batting average

Description
Takes number of hits and divides by at bats. 1.000 (read “one-thousand” is perfect)

Usage
ba(h, ab)

Arguments
h  Number of hits
ab  Number of at bats

Value
ba

Examples
ba(200, 525)

Calculates batting average against

Description
Computes pitcher’s ability to prevent hits, based on h, bfp, bb, hbp, sf, sh, and ci (catcher’s interference)

Usage
baa(h, bfp, bb, hbp, sh, sf, ci)

Arguments
h  Number of hits allowed
bfp  Number of batters facing pitcher
bb  Number of bases on balls
hbp  Number of hit batters
sh  Number of sacrifice hits
sf  Number of sacrifice flies
ci  Number of catcher’s interference
babip

Value

Value

Examples

Examples

Calculates batting average on balls in play

Description

Generates the frequency a batter reaches a base after putting the ball in play (normal around .300)

Usage

Usage

Arguments

Arguments

Value

Value

Examples

Examples
**Calculates bases on balls per nine innings pitched (W/9)**

**Description**
Computes bases on balls (walks) per nine innings pitched

**Usage**
```
bb9(bb, ip)
```

**Arguments**
- **bb**: Number of bases on balls
- **ip**: Number of innings pitched

**Value**
```
bb9
```

**Examples**
```
bb9(35, R10)
```

---

**bb_k**

*Calculates walk to strikeout ratio (batting)*

**Description**
Takes the number of bases on balls and divides by number of strikeouts (for pitching version, see "k_bb")

**Usage**
```
bb_k(bb, k)
```

**Arguments**
- **bb**: Number of bases on balls
- **k**: Number of strikeouts

**Value**
```
bb_k
```

**Examples**
```
bb_k(65, 125)
```
**BsR**

*Calculates the base runs estimator*

**Description**

Takes the number of hits, bases on balls, home runs, total bases, and at bats to compute the base runs estimator, which is similar to runs created.

**Usage**

\[
\text{BsR}(h, \ bb, \ hr, \ tb, \ ab)
\]

**Arguments**

\[
\begin{align*}
  h & : \text{Number of hits} \\
  \bb & : \text{Number of bases on balls} \\
  \hr & : \text{Number of home runs} \\
  \tb & : \text{Number of total bases (one for 1B, two for 2B, three for 3B, and four for HR)} \\
  \ab & : \text{Number of at bats}
\end{align*}
\]

**Value**

BsR

**Examples**

\[
\text{BsR}(135, 22, 12, 155, 330)
\]

---

**dice**

*Calculates defense-independent component earned run average*

**Description**

Computes earned run average from hits and walks (compare with "era" which is the traditional formula for earned run average, "aera" which is a pitcher’s adjusted earned run average, or "erc" which is the component earned run average).

**Usage**

\[
\text{dice}(\bb, \ hbp, \ hr, \ k, \ ip)
\]
Arguments

- `bb`: Number of bases on balls
- `hbp`: Number of hit batters
- `hr`: Number of home runs
- `k`: Number of strikeouts
- `ip`: Number of innings pitched

Value

dice

Examples

dice(45, 10, 60, 130, 400)

dice(45, 10, 60, 130, 400)

EqA

Calculates equivalent average

Description

Takes the number of hits, total bases, bases on balls, hits by pitch, stolen bases, sacrifice hits, sacrifice flies, at bats, and caught stealing to compute the base runs, which is a player's batting average absent park and league effects.

Usage

`EqA(h, tb, bb, hbp, sb, sh, sf, ab, cs)`

Arguments

- `h`: Number of hits
- `tb`: Number of total bases (one for 1B, two for 2B, three for 3B, and four for HR)
- `bb`: Number of bases on balls
- `hbp`: Number of hits by pitch
- `sb`: Number of stolen bases
- `sh`: Number of sacrifice hits (typically bunts)
- `sf`: Number of sacrifice flies
- `ab`: Number of at bats
- `cs`: Number of caught stealing

Value

`EqA`

Examples

`EqA(135, 155, 22, 3, 15, 4, 2, 365, 1)`
Calculates earned run average

Description

Computes a pitcher’s earned run average (compare with "erc" which is the component earned run average, "aera" which is a pitcher’s adjusted earned run average, or "dice" which is the defense-independent component earned run average)

Usage

\[ \text{era}(\text{er}, \text{ip}) \]

Arguments

- \( \text{er} \) Number of runs that did not occur as a result of errors or passed balls
- \( \text{ip} \) Number of innings pitched

Value

\[ \text{era} \]

Examples

\[ \text{era}(150, 400) \]

Calculates component earned run average

Description

Computes earned run average from hits and walks (compare with "era" which is the traditional formula for earned run average, "aera" which is a pitcher’s adjusted earned run average, or "dice" which is the defense-independent component earned run average)

Usage

\[ \text{erc}(h, \text{bb}, \text{hbp}, \text{hr}, \text{ibb}, \text{bfp}, \text{ip}) \]
Arguments

- `h`: Number of hits allowed
- `bb`: Number of bases on balls
- `hbp`: Number of hit batters
- `hr`: Number of home runs
- `ibb`: Number of intentional bases on balls
- `bfp`: Number of batters faced by pitcher
- `ip`: Number of innings pitched

Value

- `erc`

Examples

```python
erc(110, 45, 10, 70, 5, 400, R15)
```

---

**fip**

*Calculates fielding independent pitching*

Description

Computes pitching performance statistic similar to ERA, but based on factors within the pitcher’s control (compare with “dice” which is the defense-independent component earned run average)

Usage

`fip(hr, bb, k, ip)`

Arguments

- `hr`: Number of home runs
- `bb`: Number of bases on balls
- `k`: Number of strikeouts
- `ip`: Number of innings pitched

Value

- `fip`

Examples

```python
fip(65, 50, 100, 175)
```
Calculates fielding percentage

**Description**

Computes the fielding percentage (aka, fielding average), which reflects the percentage of proper ball handling.

**Usage**

```
fp(p, a, e)
```

**Arguments**

- `p`: Number of putouts
- `a`: Number of assists
- `e`: Number of errors

**Value**

`fp`

**Examples**

```
fp(13, 4, 2)
```

Calculates ground outs-fly outs ratio (GO/AO)

**Description**

Takes the number of ground ball outs and divides by number of fly ball outs to compute the GO/AO ratio.

**Usage**

```
go_ao(go, ao)
```

**Arguments**

- `go`: Number of ground ball outs
- `ao`: Number of fly ball outs

**Value**

`go_ao`
Examples

    go_ao(150, 88)

---

**gpa**

*Calculates gross production average*

### Description

Computes the gross production average, which is 1.8 times on-base percentage (OBP) plus slugging percentage (SLG), divided by four

### Usage

    gpa(h, bb, hbp, ab, sf, b1, b2, b3, hr)

### Arguments

- **h**: Number of hits
- **bb**: Number of bases on balls
- **hbp**: Number of hits by pitch
- **ab**: Number of at bats
- **sf**: Number of sacrifice flies
- **b1**: Number of singles
- **b2**: Number of doubles
- **b3**: Number of triples
- **hr**: Number of home runs

### Value

    gpa

### Examples

    gpa(150, 40, 2, 400, 5, 100, 40, 3, 7)
**h9**  
*Calculates hits per nine innings pitched (H/9IP)*

**Description**

Calculates hits per nine innings pitched

**Usage**

```
h9(h, ip)
```

**Arguments**

- `h` Number of hits allowed
- `ip` Number of innings pitched

**Value**

h9

**Examples**

```
h9(150, 175)
```

---

**iso**  
*Calculates isolated power*

**Description**

Calculates isolated power, which is a player’s ability to obtain extra bases from a hit. The statistic subtracts a hitter’s batting average from the slugging percentage, with the maximum ISO being 3.000.

**Usage**

```
iso(b1, b2, b3, hr, ab, h)
```

**Arguments**

- `b1` Number of singles
- `b2` Number of doubles
- `b3` Number of triples
- `hr` Number of home runs
- `ab` Number of at bats
- `h` Number of hits
**k9**

*Calculates strikeouts per nine innings pitched (K/9)*

**Description**

Computes strikeouts per nine innings pitched

**Usage**

\[ k9(k, ip) \]

**Arguments**

- \( k \) Number of strikeouts
- \( ip \) Number of innings pitched

**Value**

\( k9 \)

**Examples**

\[ k9(105, 175) \]

---

**k_bb**

*Calculates strikeout to walk ratio (pitching)*

**Description**

Computes strikeouts to walk ratio, based on number of strikeouts and number of walks (for batting version, see "bb_k")

**Usage**

\[ k_bb(k, bb) \]
Arguments

k Number of strikeouts

bb Number of bases on balls

Value

k_bb

Examples

k_bb(105, 40)

---

obp \textit{Calculates on-base percentage}

Description

Computes the on-base percentage based on number of hits, bases on balls, hits by pitch, at bats, and sacrifice flies

Usage

\texttt{obp(h, bb, hbp, ab, sf)}

Arguments

h Number of hits

bb Number of bases on balls

hbp Number of hits by pitch

ab Number of at bats

sf Number of sacrifice flies

Value

obp

Examples

\texttt{obp(150, 40, 2, 400, 5)}
ops  

*Calculates on-base plus slugging*

**Description**

Computes the on-base percentage plus slugging average (OPS) based on number of hits, bases on balls, hits by pitch, at bats, sacrifice flies, and total weighted bases (represented individually, as in SLG and GPA calculations)

**Usage**

ops(h, bb, hbp, ab, sf, b1, b2, b3, hr)

**Arguments**

- h: Number of hits
- bb: Number of bases on balls
- hbp: Number of hits by pitch
- ab: Number of at bats
- sf: Number of sacrifice flies
- b1: Number of singles
- b2: Number of doubles
- b3: Number of triples
- hr: Number of home runs

**Value**

ops

**Examples**

ops(200, 18, 4, 401, 4, 50, 20, 3, 13)

pafa  

*Calculates park factor*

**Description**

Computes the runs a team scores at home versus away (it is often used in other metrics, e.g., adjusted era (ERA+) for pitchers; see "aera")

**Usage**

pafa(home_rs, home_ra, home_r, road_rs, road_ra, road_r)
pa_so

Arguments

- `home_rs` Number of pitcher’s team runs scored at home park
- `home_ra` Number of pitcher’s team runs allowed at home park
- `home_r` Total number of runs scored at home park
- `road_rs` Number of pitcher’s team runs scored at away park
- `road_ra` Number of pitcher’s team runs allowed at away park
- `road_r` Total number of runs scored at away park

Value

`pafa`

Examples

`pafa(5, 6, 11, 4, 8, 1R)` # for a pair of games (one home, one away)

\[\text{Calculates plate appearances per strikeout (PA/SO)}\]

Description

Computes the number of times a hitter strikes out in relation to their plate appearances

Usage

`pa_so(pa, so)`

Arguments

- `pa` Number of plate appearances
- `so` Number of strikeouts

Value

`pa_so`

Examples

`pa_so(450, 120)`
pfr  
*Calculates power finesse ratio*

**Description**
Computes pitcher’s performance either by game or overall, based on k, bb, and ip

**Usage**
pfr(k, bb, ip)

**Arguments**
- k  Number of strikeouts
- bb Number of bases on balls
- ip Number of innings pitched

**Value**
pfr

**Examples**
pfr(115, 30, 400)

---

ra  
*Calculates run average*

**Description**
Computes pitcher’s run average based on number of runs allowed and innings pitched

**Usage**
ra(r, ip)

**Arguments**
- r  Number of runs allowed
- ip  Number of innings pitched

**Value**
ra

**Examples**
ra(75, 400)
Calculates runs created

**Description**

Computes the basic version of the estimated runs a hitter creates or contributes (see also "rc2" for the 'stolen base' iteration and "rc3" for the technical iteration of the rc statistic)

**Usage**

\[ rc(h, bb, tb, ab) \]

**Arguments**

- **h**: Number of hits
- **bb**: Number of bases on balls
- **tb**: Number of total bases (one for 1B, two for 2B, three for 3B, and four for HR)
- **ab**: Number of at bats

**Examples**

\[ rc(150, 35, 165, 400) \]

Calculates runs created accounting for stolen bases

**Description**

Computes the estimated runs a hitter creates or contributes, accounting for base stealing (see also "rc" for the basic iteration and "rc3" for the technical iteration of the rc statistic)

**Usage**

\[ rc2(h, bb, tb, ab, cs, sb) \]

**Arguments**

- **h**: Number of hits
- **bb**: Number of bases on balls
- **tb**: Number of total bases (one for 1B, two for 2B, three for 3B, and four for HR)
- **ab**: Number of at bats
- **cs**: Number of stolen bases caught
- **sb**: Number of stolen bases
Value

rc2

Examples

rc2(150, 35, 165, 400, 7, 9)

---

rc3  

*Calculates runs created accounting for all offensive indicators*

Description

Computes the technical iteration of estimated runs a hitter creates or contributes accounting for virtually all offensive indicators (see also "rc" for the basic iteration and "rc2" for the 'stolen base' iteration of the rc statistic)

Usage

rc3(h, bb, ibb, tb, ab, cs, sb, hbp, gidp, sh, sf)

Arguments

- h  Number of hits
- bb Number of bases on balls
- ibb Number of intentional bases on balls
- tb Number of total bases (one for 1B, two for 2B, three for 3B, and four for HR)
- ab Number of at bats
- cs Number of stolen bases caught
- sb Number of stolen bases
- hbp Number of hits by pitch
- gidp Number of grounded into double play
- sh Number of sacrifice hits
- sf Number of sacrifice flies

Value

rc3

Examples

rc3(150, 35, 3, 165, 400, 7, 9, 5, 1, 6, 2)
rfa

*Calculates range factor*

**Description**
Computes the amount of the field covered by a player

**Usage**
rfa(p, a, ip)

**Arguments**
- **p**: Number of putouts
- **a**: Number of assists
- **ip**: Number of innings played in a defensive position

**Value**
rfa

**Examples**
rfa(20, 5, 450)

risp

*Calculates batting average with runners in scoring position*

**Description**
Computes batting average accounting for runners in scoring position

**Usage**
risp(hrisp, abrisp)

**Arguments**
- **hrisp**: Number of hits with runners in scoring position (on either 2nd or 3rd base)
- **abrisp**: Number of at bats with runners in scoring position (on either 2nd or 3rd base)

**Value**
risp

**Examples**
risp(35, 120)
**rp**  
*Calculates runs produced*

**Description**
Computes the number of runs contributed by a hitter, based on runs, runs batted in, and home runs

**Usage**
\[ rp(r, rbi, hr) \]

**Arguments**
- \( r \)  
  Number of runs  
- \( rbi \)  
  Number of runs batted in  
- \( hr \)  
  Number of home runs

**Examples**
\[ rp(70, 41, 22) \]

---

**sba**  
*Calculates stolen base attempts*

**Description**
Computes total attempts to steal a base, by adding \( sb \) and \( cs \)

**Usage**
\[ sba(sb, cs) \]

**Arguments**
- \( sb \)  
  Number of stolen bases  
- \( cs \)  
  Number of caught stealing

**Examples**
\[ sba(20, 4) \]
**sbsr**  
*Calculates stolen base success rate*

**Description**  
Computes percentage of bases successfully stolen

**Usage**  
`sbsr(sb, cs)`

**Arguments**  
- **sb**: Number of stolen bases  
- **cs**: Number of caught stealing

**Value**  
`sbsr`

**Examples**  
`sbsr(20, 4)`

---

**slg**  
*Calculates slugging percentage*

**Description**  
Computes the slugging percentage (SLG), based on the weighted number of singles, doubles, triples, home runs, and at bats

**Usage**  
`slg(b1, b2, b3, hr, ab)`

**Arguments**  
- **b1**: Number of singles  
- **b2**: Number of doubles  
- **b3**: Number of triples  
- **hr**: Number of home runs  
- **ab**: Number of at bats
Value

slg

Examples

slg(100, 40, 3, 7, 350)

taxa

Calculates total average

Description

Computes overall offensive contribution of a single player

Usage

taxa(tb, hbp, bb, sb, ab, h, cs, gidp)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tb</td>
<td>Number of total bases (one for 1B, two for 2B, three for 3B, and four for HR)</td>
</tr>
<tr>
<td>hbp</td>
<td>Number of hits by pitch</td>
</tr>
<tr>
<td>bb</td>
<td>Number of bases on balls</td>
</tr>
<tr>
<td>sb</td>
<td>Number of stolen bases</td>
</tr>
<tr>
<td>ab</td>
<td>Number of at bats</td>
</tr>
<tr>
<td>h</td>
<td>Number of hits</td>
</tr>
<tr>
<td>cs</td>
<td>Number of caught stealing</td>
</tr>
<tr>
<td>gidp</td>
<td>Number of grounded into double play</td>
</tr>
</tbody>
</table>

Value

taxa

Examples

taxa(125, 11, 40, 10, 400, 105, 2, 6)
**tc**  
*Calculates total chances*

**Description**  
Computes the opportunities for defensive ball handling

**Usage**  
`tc(p, a, e)`

**Arguments**
- `p` Number of putouts  
- `a` Number of assists  
- `e` Number of errors

**Value**  
`tc`

**Examples**  
`tc(11, 5, 5)`

---

**tob**  
*Calculates times on base*

**Description**  
Computes total times a player reaches a base by adding `h`, `hbp`, and `bb`

**Usage**  
`tob(h, hbp, bb)`

**Arguments**
- `h` Number of hits  
- `hbp` Number of hits by pitch  
- `bb` Number of bases on balls

**Value**  
`tob`
vorp  \textit{Calculates value over replacement player (pitching)}

\textbf{Description}

Computes a pitcher’s marginal utility

\textbf{Usage}

\texttt{vorp(ip, lr, lg, r)}

\textbf{Arguments}

\begin{itemize}
  \item \texttt{ip}  \quad \text{Number of innings pitched}
  \item \texttt{lr}  \quad \text{Number of league runs}
  \item \texttt{lg}  \quad \text{Number of league games played}
  \item \texttt{r}  \quad \text{Number of runs}
\end{itemize}

\textbf{Value}

\texttt{vorp}

\textbf{Examples}

\texttt{vorp(400, 98, 20, 110)}

\textit{whip}  \textit{Calculates walks plus hits per innings pitched (WHIP)}

\textbf{Description}

Computes walks plus hits per innings pitched, which reflects the number of baserunners allowed by a pitcher over a given period

\textbf{Usage}

\texttt{whip(bb, h, ip)}

\textbf{Arguments}

\begin{itemize}
  \item \texttt{bb}  \quad \text{Number of bases on balls}
  \item \texttt{h}  \quad \text{Number of hits allowed}
  \item \texttt{ip}  \quad \text{Number of innings pitched}
\end{itemize}
wr

**Value**

\text{whip}

**Examples**

\text{whip(50, 110, 425)}

---

\text{wr} \quad \textit{Calculates whiff rate}

---

**Description**

Computes pitcher’s ability to get a batter to swing and miss pitches over any period of time (e.g., in a single game, single season, career, etc.)

**Usage**

\text{wr(sw, \; tp)}

**Arguments**

\begin{itemize}
  \item \textit{sw} \quad \text{Number of swings and misses}
  \item \textit{tp} \quad \text{Total pitches thrown}
\end{itemize}

**Value**

\text{wr}

**Examples**

\text{wr(300, 750)}

---

\text{wra} \quad \textit{Calculates win ratio}

---

**Description**

Computes a team’s win ratio, which is used in the so-called "Pythagorean expectation"

**Usage**

\text{wra(rs, \; ra)}

**Arguments**

\begin{itemize}
  \item \textit{rs} \quad \text{Number of runs scored}
  \item \textit{ra} \quad \text{Number of runs allowed}
\end{itemize}
**Value**

wra

**Examples**

wra(400, 301)

---

**xbh**

*Calculates extra base hits*

**Description**

Computes total hits by a player greater than singles (1B) by adding 2B, 3B, and hr

**Usage**

xbh(b2, b3, hr)

**Arguments**

- b2: Number of doubles
- b3: Number of triples
- hr: Number of home runs

**Value**

xbh

**Examples**

xbh(20, 18, 4)
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