

**Measuring a Measure:
Absolute Time as a Factor in Meter Classification
for Pop/Rock Music**

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Kennesaw State University

Slides available at: www.midside.com/slides/

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Three possible readings of meter and bar lengths for “Norwegian Wood” (The Beatles, 1965)

Pollack 1993



I once had a girl, or should I say, she once had me.

The musical notation for the Pollack 1993 reading is in 3/4 time. The melody is written on a single staff with a treble clef and a key signature of three sharps (F#, C#, G#). The lyrics are: "I once had a girl, or should I say, she once had me." The melody consists of a series of eighth and quarter notes, with a final quarter rest.

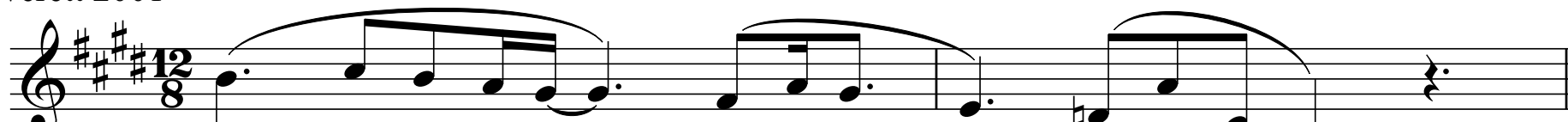
Covach 2006



I once had a girl, or should I say, she once had me.

The musical notation for the Covach 2006 reading is in 6/8 time. The melody is written on a single staff with a treble clef and a key signature of three sharps (F#, C#, G#). The lyrics are: "I once had a girl, or should I say, she once had me." The melody consists of a series of eighth and quarter notes, with a final quarter rest.

Everett 2001



I once had a girl, or should I say, she once had me.

The musical notation for the Everett 2001 reading is in 12/8 time. The melody is written on a single staff with a treble clef and a key signature of three sharps (F#, C#, G#). The lyrics are: "I once had a girl, or should I say, she once had me." The melody consists of a series of eighth and quarter notes, with a final quarter rest.

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Three possible readings of meter and bar lengths for “Norwegian Wood” (The Beatles, 1965)

Pollack 1993

Musical notation for the Pollack 1993 reading. The score is in treble clef with a key signature of three sharps (F#, C#, G#) and a 3/4 time signature. The melody consists of three phrases: 'I once had a girl,' (4 bars), 'or should I say,' (4 bars), and 'she once had me.' (4 bars). Each phrase is marked with a slur. The lyrics are printed below the notes.

I once had a girl, or should I say, she once had me.

Covach 2006

Musical notation for the Covach 2006 reading. The score is in treble clef with a key signature of three sharps (F#, C#, G#) and a 6/8 time signature. The melody consists of three phrases: 'I once had a girl,' (4 bars), 'or should I say,' (4 bars), and 'she once had me.' (4 bars). Each phrase is marked with a slur. The lyrics are printed below the notes.

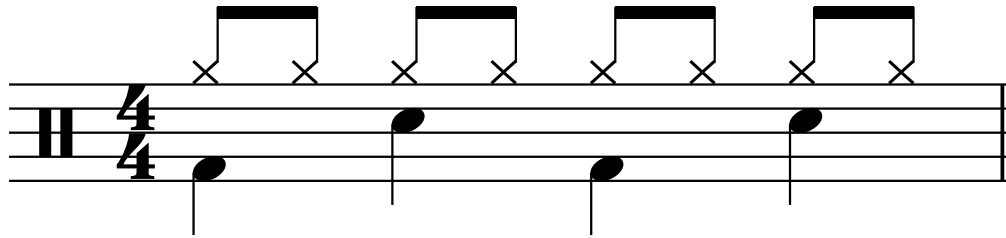
I once had a girl, or should I say, she once had me.

Everett 2001

Musical notation for the Everett 2001 reading. The score is in treble clef with a key signature of three sharps (F#, C#, G#) and a 12/8 time signature. The melody consists of three phrases: 'I once had a girl,' (4 bars), 'or should I say,' (4 bars), and 'she once had me.' (4 bars). Each phrase is marked with a slur. The lyrics are printed below the notes.

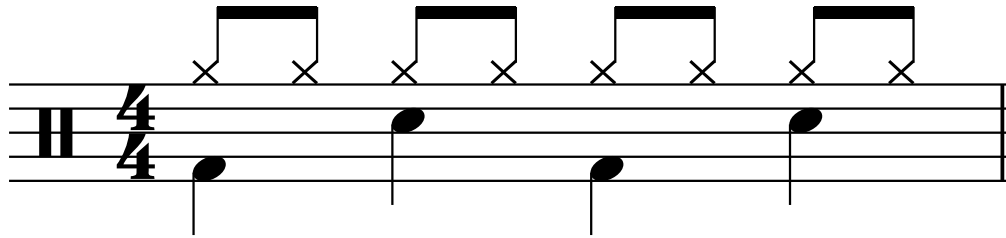
I once had a girl, or should I say, she once had me.

Kick and snare configurations for a “standard rock beat”



(Moore 2001; Stephenson 2002)

Kick and snare configurations for a “standard rock beat”



(Moore 2001; Stephenson 2002)

Some recent research on rhythm & meter in pop/rock music

- Butler 2001
- Pieslak 2007
- Osborn 2010
- Rosenberg 2011
- McCandless 2013
- Osborn 2014
- Biamonte 2014
- Attas 2015

Some recent research on rhythm & meter in pop/rock music

- Butler 2001
- Pieslak 2007
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Standard (recent) music theory scholarship on rhythm & meter

- Lerdahl & Jackendoff 1983
- Lester 1986
- Rothstein 1989
- Hasty 1997
- Krebs 1999
- Temperley 2001

Standard (recent) music theory scholarship on rhythm & meter

- Lerdahl & Jackendoff 1983
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Recent scholarship on beat (i.e., *tactus*) perception

Standard (recent) music theory scholarship on rhythm & meter

- Lerdahl & Jackendoff 1983
- Lester 1986
- Rothstein 1989
- Hasty 1997
- Krebs 1999
- Temperley 2001

Recent scholarship on beat (i.e., *tactus*) perception

<i>Source</i>	<i>Ideal Tactus</i>
Lerdahl & Jackendoff 1983	70 BPM

Standard (recent) music theory scholarship on rhythm & meter

- Lerdahl & Jackendoff 1983
- Lester 1986
- Rothstein 1989
- Hasty 1997
- Krebs 1999
- Temperley 2001

Recent scholarship on beat (i.e., *tactus*) perception

<i>Source</i>	<i>Ideal Tactus</i>
Lerdahl & Jackendoff 1983	70 BPM
Fraisse 1982	100 BPM
Parncutt 1994	100 BPM
Semjen et al. 1998	100 BPM

Standard (recent) music theory scholarship on rhythm & meter

- Lerdahl & Jackendoff 1983
- Lester 1986
- Rothstein 1989
- Hasty 1997
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- Temperley 2001

Recent scholarship on beat (i.e., *tactus*) perception

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Lerdahl & Jackendoff 1983	70 BPM
Fraisse 1982	100 BPM
Parncutt 1994	100 BPM
Semjen et al. 1998	100 BPM
Moelants 2002	120 BPM
Moelants & McKinney 2004	120 BPM
Levy 2011	120 BPM

Recent scholarship on beat (i.e., *tactus*) perception

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Digital Audio Workstations with a session default of 4/4, 120 BPM

- Ableton Live
- Apple Garage Band
- Apple Logic Pro
- Avid Pro Tools
- Cockos Reaer
- MOTU Digital Performer
- Presonus Studio One
- Propellerhead Reason
- Sony Acid Pro
- Steinberg Cubase Pro

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Average tempos & measure lengths for songs categorized as 4/4

	Covach 2009	Burgoyne et al. 2011	Temperley & deClercq, 2013
Number of songs in 4/4 (as percent of total songs)	61 75.3%	509 93.2%	168 84.0%
Mean BPM (standard deviation)	121.4 22.2	119.5 33.6	119.6 34.1
(median BPM)	119.0	117.9	115.5
Mean measure length	1.98 sec	2.01 sec	2.01 sec

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Average tempos & measure lengths for songs categorized as 6/8

	Covach 2009	Burgoyne et al. 2011	Temperley & deClercq, 2013
Number of songs in 6/8 (as percent of total songs)	1 1.2%	5 0.9%	6 3.0%
Mean BPM (standard deviation)	50.0 (n/a)	64.0 11.7	62.3 9.9
(median BPM)	50.0	63.1	60.3
Mean measure length	2.4 sec	1.88 sec	1.93 sec

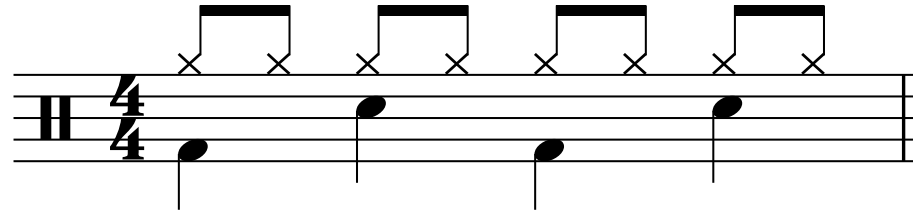
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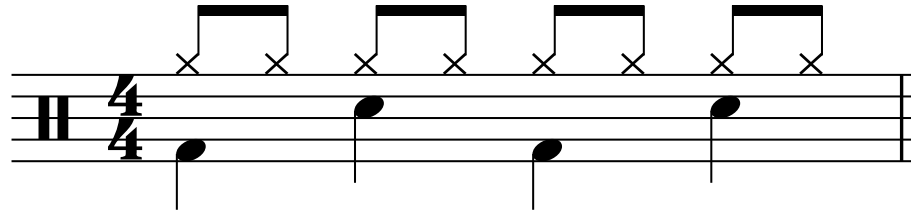
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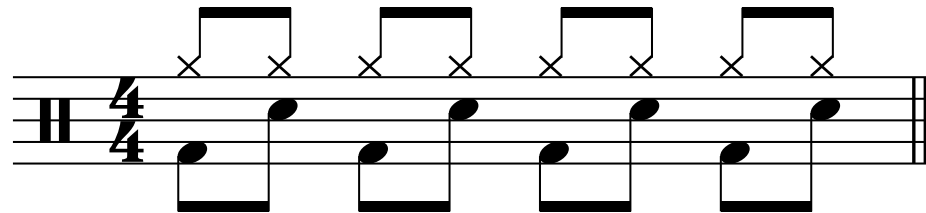
Standard rock beat



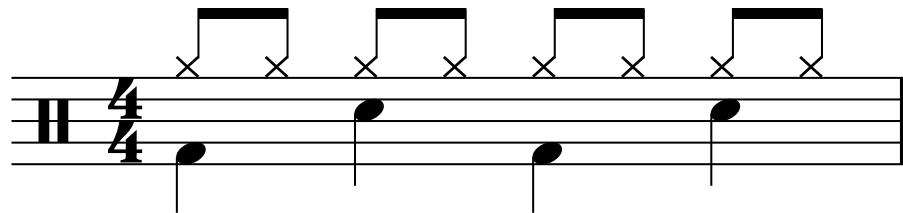
Standard rock beat



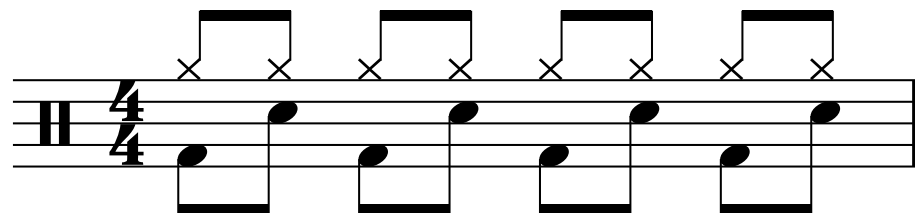
“Double-time” feel



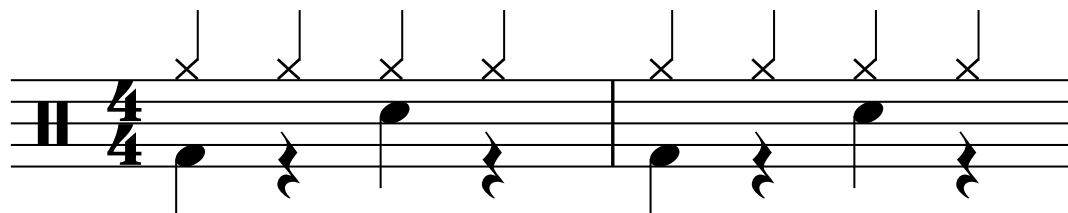
Standard rock beat



“Double-time” feel



“Half-time” feel



Standard rock beat:

“Should I Stay or Should I Go” (The Clash, 1982), verse

0:15

D G D D G D

Vox

Dar- lin', you've got to let me know, should I stay or should I go?_ If you say that you are

Kick/
Snare

G F G D G D

mine, I'll be here 'til the end of time. So, you've got to let me

A D G D

know, should I stay or should I go?

Standard rock beat:

“Should I Stay or Should I Go” (The Clash, 1982), verse

0:15

D G D D G D

Vox

Dar- lin',you've got to let me know, should I stay or should I go?_ If you say that you are

Kick/ Snare

G F G D G D

mine,___ I'll be here 'til the end of time. So, you've got to let me

A D G D

know,___ should I stay or should I go?

Standard rock beat:

“Should I Stay or Should I Go” (The Clash, 1982), verse

0:15

Vox

D G D D G D

Dar- lin', you've got to let me know, should I stay or should I go?_ If you say that you are

Kick/ Snare

G F G D G D

mine, I'll be here 'til the end of time. So, you've got to let me

A D G D

know, should I stay or should I go?

Detailed description: This musical score is for the verse of 'Should I Stay or Should I Go' in a standard rock beat. It features a vocal line and a drum line. The key signature is one sharp (F#) and the time signature is 4/4. The vocal line starts at 0:15 and includes lyrics: 'Dar- lin', you've got to let me know, should I stay or should I go?_ If you say that you are mine, I'll be here 'til the end of time. So, you've got to let me know, should I stay or should I go?'. The drum line shows a standard rock beat with a kick drum and snare. Chords are indicated above the vocal line: D, G, D, D, G, D, G, F, G, D, G, D, A, D, G, D.

Double-time feel:

“Should I Stay or Should I Go” (The Clash, 1982), chorus

1:06

Vox

D G D D G D

Should I stay or should I go now? Should I stay or should I go now? If I go there will be

Kick/ Snare

G F G D G D

trou - ble, and if I stay it will be doub- le. So come on and let me

A

know

Detailed description: This musical score is for the chorus of 'Should I Stay or Should I Go' in a double-time feel. It features a vocal line and a drum line. The key signature is one sharp (F#) and the time signature is 4/4. The vocal line starts at 1:06 and includes lyrics: 'Should I stay or should I go now? Should I stay or should I go now? If I go there will be trou - ble, and if I stay it will be doub- le. So come on and let me know'. The drum line shows a double-time feel with a kick drum and snare. Chords are indicated above the vocal line: D, G, D, D, G, D, G, F, G, D, G, D, A.

Standard rock beat:

“Should I Stay or Should I Go” (The Clash, 1982), verse

0:15

Vox

D G D D G D

Dar- lin', you've got to let me know, should I stay or should I go?... If you say that you are

Kick/ Snare

G F G D G D

mine, I'll be here 'til the end of time. So, you've got to let me

A D G D

know, should I stay or should I go?

Detailed description: This musical score is for the verse of 'Should I Stay or Should I Go' in a standard rock beat. It features a vocal line and a drum line. The key signature is one sharp (F#) and the time signature is 4/4. The vocal line starts at 0:15 and includes lyrics: 'Dar- lin', you've got to let me know, should I stay or should I go?... If you say that you are mine, I'll be here 'til the end of time. So, you've got to let me know, should I stay or should I go?'. The drum line shows a standard rock beat with a kick drum on the downbeats and snare on the backbeats. Chord symbols (D, G, F, A) are placed above the vocal line.

Double-time feel:

“Should I Stay or Should I Go” (The Clash, 1982), chorus

1:06

Vox

D G D D G D

Should I stay or should I go now? Should I stay or should I go now? If I go there will be

Kick/ Snare

G F G D G D

trou - ble, and if I stay it will be doub- le. So come on and let me

A

know

Detailed description: This musical score is for the chorus of 'Should I Stay or Should I Go' in a double-time feel. It features a vocal line and a drum line. The key signature is one sharp (F#) and the time signature is 4/4. The vocal line starts at 1:06 and includes lyrics: 'Should I stay or should I go now? Should I stay or should I go now? If I go there will be trou - ble, and if I stay it will be doub- le. So come on and let me know'. The drum line shows a double-time feel with a kick drum on the downbeats and snare on the backbeats. Chord symbols (D, G, F, A) are placed above the vocal line.

Standard rock beat:

“Teardrops on My Guitar” (Taylor Swift, 2006), “pop” version (chorus)

0:57

B \flat F/A G m E \flat

Vox

He's the rea son for the tear drops on my gui tar, the on-ly thing that keeps me wish in' on a wish in' star.

Kick/
Snare

B \flat F/A G m E \flat

He's the song in the car I keep sing- in', don't know why___ I___ do.

Standard rock beat:

“Teardrops on My Guitar” (Taylor Swift, 2006), “pop” version (chorus)

0:57

B \flat F/A G m E \flat

Vox

He's the rea son for the tear drops on my gui tar, the on-ly thing that keeps me wish in' on a wish in' star.

Kick/
Snare

B \flat F/A G m E \flat

He's the song in the car I keep sing- in', don't know why___ I___ do.

Standard rock beat:

“Teardrops on My Guitar” (Taylor Swift, 2006), “pop” version (chorus)

0:57

B \flat F/A Gm E \flat

Vox

He's the rea son for the tear drops on my gui tar, the on-ly thing that keeps me wish in' on a wish in' star.

Kick/
Snare

B \flat F/A Gm E \flat

He's the song in the car I keep sing- in', don't know why I do.

Half-time feel:

“Teardrops on My Guitar” (Taylor Swift, 2006), album version (chorus)

1:07

B \flat F/A Gm E \flat

Vox

He's the rea son for the tear drops on my gui tar, the on ly thing that keeps me wish in' on a wish in' star.

Kick/
Snare

Standard rock beat:

“Teardrops on My Guitar” (Taylor Swift, 2006), “pop” version (chorus)

0:57

B \flat F/A Gm E \flat

Vox

He's the rea son for the tear drops on my gui tar, the on-ly thing that keeps me wish in' on a wish in' star.

Kick/
Snare

B \flat F/A Gm E \flat

He's the song in the car I keep sing- in', don't know why I do.

Half-time feel:

“Teardrops on My Guitar” (Taylor Swift, 2006), album version (chorus)

1:07

B \flat F/A Gm E \flat

Vox

He's the rea son for the tear drops on my gui tar, the on ly thing that keeps me wish in' on a wish in' star.

Kick/
Snare

“When the Levee Breaks” (Led Zeppelin, 1971), 6-bar reading of opening material

1:23 F

Vox

If it keeps on ra-in in', lev-ee's goin' to break. If it...

Drums

keeps on ra - in in', lev-ee's goin' to break. When the

lev - ee breaks, have no place_ to stay.---

“When the Levee Breaks” (Led Zeppelin, 1971), 6-bar reading of opening material

1:23 F

Vox

**“When the Levee Breaks” (Led Zeppelin, 1971),
6-bar reading of opening material**

Vox

Drums

1:23 F

If it keeps on ra-in in', lev-ee's goin' to break. If it...

**“When the Levee Breaks” (Joe McCoy & Memphis Minnie, 1929),
12-bar reading, mashed-up with Led Zeppelin drumbeat**

Vox

Drums

A

If it keeps on ra-in in', lev-ee's goin' to break. If it keeps

D A

on rain-in', lev-ee's goin' to break. and the

E A

wa-ter gon' come in, have no place to stay.

**“When the Levee Breaks” (Led Zeppelin, 1971),
6-bar reading of opening material**

Vox

1:23 F

If it keeps on ra-in in', lev-ee's goin' to break. If it...

Drums

**“When the Levee Breaks” (Joe McCoy & Memphis Minnie, 1929),
12-bar reading, mashed-up with Led Zeppelin drumbeat**

Vox

A

If it keeps on ra-in in', lev-ee's goin' to break. If it keeps

Drums

D A

on rain-in', lev-ee's goin' to break. and the

E A

wa-ter gon' come in, have no place to stay.

“Heartbreak Hotel” (Elvis Presley, 1956), main material

0:00



Well since my baby left me, Well I found a new place to dwell. Well it's down at the end of lonely street, that Heartbreak Hotel where I'll be.



I'll be so lonely, baby. Well I'm so lonely, I'll be so lonely, I could die.

“Heartbreak Hotel” (Elvis Presley, 1956), main material

0:00



Musical notation for the first line of the song, starting at 0:00. The key signature is three sharps (F#, C#, G#) and the time signature is 12/8. The melody is written on a treble clef staff. A chord symbol 'E' is placed above the first measure. The lyrics are: "Well since my baby left me, Well I found a new place to dwell. Well it's down at the end of lonely street, that Heartbreak Hotel where I'll be."



Musical notation for the second line of the song. The key signature is three sharps (F#, C#, G#) and the time signature is 12/8. The melody is written on a treble clef staff. Chord symbols 'A', 'B', and 'E' are placed above the first, second, and third measures respectively. The lyrics are: "I'll be so lonely, baby. Well I'm so lonely, I'll be so lonely, I could die."

“Heartbreak Hotel” (Elvis Presley, 1956), main material

0:00

Musical notation for the first line of the song, featuring a treble clef, a key signature of three sharps (F#, C#, G#), and a 12/8 time signature. The melody is written on a single staff with a large slur over the first six measures. The lyrics 'Well since my baby left me, Well I found a new place to dwell. Well it's down at the end of lonely street, that Heartbreak Hotel where I'll be.' are positioned below the staff.

Well since my baby left me, Well I found a new place to dwell. Well it's down at the end of lonely street, that Heartbreak Hotel where I'll be.

Musical notation for the second line of the song, featuring a treble clef, a key signature of three sharps (F#, C#, G#), and a 12/8 time signature. The melody is written on a single staff with three distinct phrases, each marked with a letter above it: 'A' above the first phrase, 'B' above the second, and 'E' above the third. The lyrics 'I'll be so lonely, baby. Well I'm so lonely, I'll be so lonely, I could die.' are positioned below the staff.

I'll be so lonely, baby.

Well I'm so lonely,

I'll be so lonely, I could die.

“That’s All Right” (Elvis Presley, 1954), main material

0:05

Musical notation for the first line of the song, featuring a treble clef, a key signature of three sharps (F#, C#, G#), and a 4/4 time signature. The melody is written on a single staff with a large slur over the first four measures. The lyrics 'Well that's all right, mama, That's all right with you. That's all right, mama, just any way you do. Well that's all' are positioned below the staff.

Well that's all right, mama,

That's all right with you.

That's all right, mama,

just any way you do.

Well that's all

Musical notation for the second line of the song, featuring a treble clef, a key signature of three sharps (F#, C#, G#), and a 4/4 time signature. The melody is written on a single staff with three distinct phrases, each marked with a letter above it: 'D' above the first phrase, 'E' above the second, and 'A' above the third. The lyrics 'right, that's all right. That's all right now, mama, any way you do.' are positioned below the staff.

right,

that's all right.

That's all right now, mama,

any way you do.

PHRASE EXP.

“Heartbreak Hotel” (Elvis Presley, 1956), main material

0:00

Musical notation for the first line of the song, starting at 0:00. The key signature is three sharps (F#, C#, G#) and the time signature is 12/8. The melody is written on a treble clef staff with a single sharp (F#). A large bracket labeled 'E' spans the entire line. The lyrics are: "Well since my baby left me, Well I found a new place to dwell. Well it's down at the end of lonely street, that Heartbreak Hotel where I'll be."

Well since my baby left me, Well I found a new place to dwell. Well it's down at the end of lonely street, that Heartbreak Hotel where I'll be.

Musical notation for the second line of the song. The key signature is three sharps (F#, C#, G#) and the time signature is 12/8. The melody is written on a treble clef staff with a single sharp (F#). Three brackets labeled 'A', 'B', and 'E' are placed above the staff, corresponding to the lyrics below. The lyrics are: "I'll be so lonely, baby. Well I'm so lonely, I'll be so lonely, I could die."

I'll be so lonely, baby.

Well I'm so lonely,

I'll be so lonely, I could die.

“That’s All Right” (Elvis Presley, 1954), main material

0:05

Musical notation for the first line of the song, starting at 0:05. The key signature is three sharps (F#, C#, G#) and the time signature is 4/4. The melody is written on a treble clef staff with a single sharp (F#). A large bracket labeled 'A' spans the entire line. The lyrics are: "Well that's all right, mama, That's all right with you. That's all right, mama, just any way you do. Well that's all"

Well that's all right, mama,

That's all right with you.

That's all right, mama,

just any way you do.

Well that's all

Musical notation for the second line of the song. The key signature is three sharps (F#, C#, G#) and the time signature is 4/4. The melody is written on a treble clef staff with a single sharp (F#). Three brackets labeled 'D', 'E', and 'A' are placed above the staff, corresponding to the lyrics below. The lyrics are: "right, that's all right. That's all right now, mama, any way you do."

right,

that's all right.

That's all right now, mama,

any way you do.

PHRASE EXP.

Buck Owens voice-leading schema

The image displays a musical score for a voice-leading schema, consisting of two staves: a treble clef staff on top and a bass clef staff on the bottom. The score is divided into measures, with measure numbers *m.1*, *m.3*, *m.5*, *m.7*, *m.9*, *m.11*, *m.13*, and *m.15* indicated above the treble staff. Fingerings are indicated by numbers 1, 2, and 3 with a caret (^) above them. Chord symbols I, IV, V, and I are placed below the bass staff. The treble staff features a melodic line with various note values and rests, connected by solid and dashed lines. The bass staff features a bass line with notes and rests, also connected by solid and dashed lines. Thick black bars are placed above the treble staff and below the bass staff to indicate specific intervals or chord structures.

m.1 *m.3* *m.5* *m.7* *m.9* *m.11* *m.13* *m.15*

I IV V I

“Down to the River” (Buck Owens, 1962), verse

0:33 G D

Vocal

You said good-bye to me this mornin' and

slow - ly walked out of my life. I

don't know how I'll live without you; I

on - ly know I've got-ta try.

D G

G C

IV. Analysis

m.1 *m.3* *m.5* *m.7* *m.9* *m.11* *m.13* *m.15*

I IV V I

“Down to the River” (Buck Owens, 1962), verse

0:33 G D

Vocal

You said good-bye to me this mornin' and

Drums

D G

slow - ly walked out of my life. I

G C

don't know how I'll live without you; I

D G

on - ly know I've got-ta try.

IV. Analysis

m.1 m.3 m.5 m.7 m.9 m.11 m.13 m.15

I IV V I

“Cryin’ Time” (Buck Owens, 1964), verse

0:28 A^b E^b

Vox

Now they say that ab-sence makes the heart grow fond - er and that

tears are on - ly rain to make love grow. Well my love

for you could ne - ver grow no strong - er if I

live to be a hu - nd - red years old.

Drums

m.1 m.3 m.5 m.7 m.9 m.11 m.13 m.15

I IV V I

“Cryin’ Time” (Buck Owens, 1964), verse

0:28 Ab Eb

Vox

Now they say that ab-sence makes the heart grow fond - er and that

tears are on - ly rain to make love grow. Well my love

for you could ne - ver grow no strong - er if I

live to be a hu - nd - red years old.

Eb Ab

Ab Db


Ab Eb Ab

Drums

- The drum pattern is not a reliable guide for measure lengths
- Absolute time should be considered in bar length decisions
- The 2-second measure may be the ideal perceptual reference

Three possible readings of meter and bar lengths for “Norwegian Wood” (The Beatles, 1965)

Pollack 1993



I once had a girl, or should I say, she once had me.

The musical notation for Pollack 1993 shows a treble clef, a key signature of three sharps (F#, C#, G#), and a 3/4 time signature. The melody is written across three phrases: 'I once had a girl,' (4 bars), 'or should I say,' (4 bars), and 'she once had me.' (4 bars). The notes are: I (quarter), once (quarter), had (quarter), a (quarter), girl, (half) | or (quarter), should (quarter), I (quarter), say, (half) | she (quarter), once (quarter), had (quarter), me. (half).

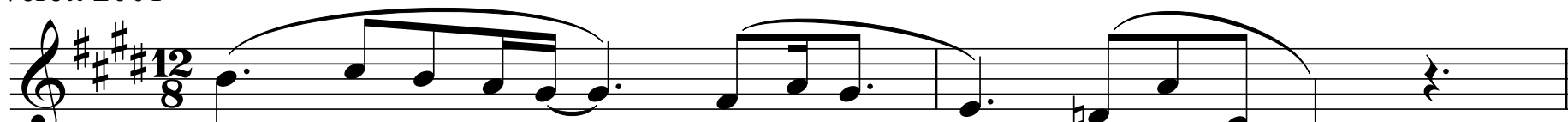
Covach 2006



I once had a girl, or should I say, she once had me.

The musical notation for Covach 2006 shows a treble clef, a key signature of three sharps (F#, C#, G#), and a 6/8 time signature. The melody is written across three phrases: 'I once had a girl,' (4 bars), 'or should I say,' (4 bars), and 'she once had me.' (4 bars). The notes are: I (quarter), once (quarter), had (quarter), a (quarter), girl, (half) | or (quarter), should (quarter), I (quarter), say, (half) | she (quarter), once (quarter), had (quarter), me. (half).

Everett 2001

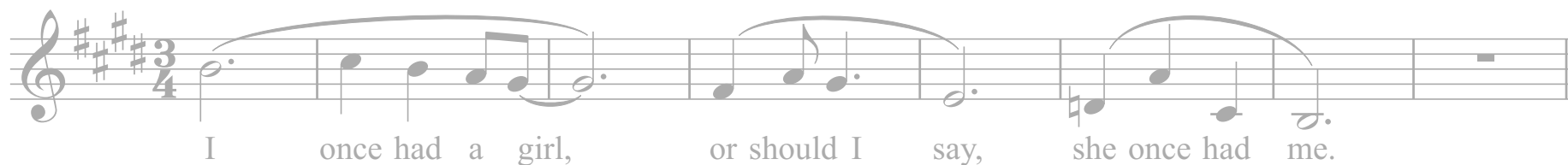


I once had a girl, or should I say, she once had me.

The musical notation for Everett 2001 shows a treble clef, a key signature of three sharps (F#, C#, G#), and a 12/8 time signature. The melody is written across three phrases: 'I once had a girl,' (4 bars), 'or should I say,' (4 bars), and 'she once had me.' (4 bars). The notes are: I (quarter), once (quarter), had (quarter), a (quarter), girl, (half) | or (quarter), should (quarter), I (quarter), say, (half) | she (quarter), once (quarter), had (quarter), me. (half).

Three possible readings of meter and bar lengths for “Norwegian Wood” (The Beatles, 1965)

Pollack 1993



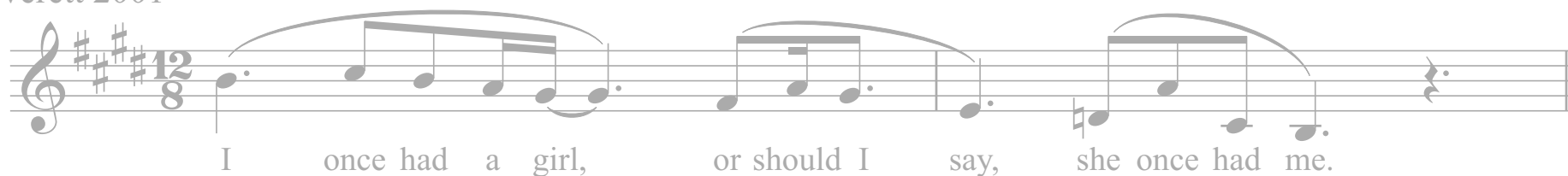
Musical notation for the Pollack 1993 reading. The score is in treble clef with a key signature of three sharps (F#, C#, G#) and a 3/4 time signature. The melody is written on a single staff with a 12-measure bar length. The lyrics are: "I once had a girl, or should I say, she once had me." The melody consists of quarter and eighth notes, with a final quarter rest in the 12th measure.

Covach 2006



Musical notation for the Covach 2006 reading. The score is in treble clef with a key signature of three sharps (F#, C#, G#) and a 6/8 time signature. The melody is written on a single staff with a 12-measure bar length. The lyrics are: "I once had a girl, or should I say, she once had me." The melody consists of quarter and eighth notes, with a final quarter rest in the 12th measure.

Everett 2001



Musical notation for the Everett 2001 reading. The score is in treble clef with a key signature of three sharps (F#, C#, G#) and a 12/8 time signature. The melody is written on a single staff with a 12-measure bar length. The lyrics are: "I once had a girl, or should I say, she once had me." The melody consists of quarter and eighth notes, with a final quarter rest in the 12th measure.

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Beat Rate (BPM)	Quadruple Measure	Triple Measure	Duple Measure
30	8.00	6.00	4.00
34	7.03	5.27	3.51
39	6.17	4.63	3.08
44	5.42	4.06	2.71
50	4.76	3.57	2.38
57	4.18	3.13	2.09
65	3.67	2.75	1.83
75	3.22	2.42	1.61
85	2.83	2.12	1.41
97	2.48	1.86	1.24
110	2.18	1.64	1.09
125	1.92	1.44	0.96
143	1.68	1.26	0.84
163	1.48	1.11	0.74
185	1.30	0.97	0.65
211	1.14	0.85	0.57
240	1.00	0.75	0.50